Only B. F. Goodrich makes the grommet belts that cut costs 20 to 50%!

Save 3 ways! Investigate today! Write or mail coupon

You save belt costs because belts last longer, save production costs because machines keep running with fewer interruptions, save maintenance costs because they need less attention.

Patented grommet belts by B. F. Goodrich represent the only basic change since invention of the V belt. Belts last 20 to 50 per cent longer, depending on service. (The more severe the service, the greater the increase over ordinary belts.) Grommet belts have more rubber; they're more flexible, give better grip, less slip.

What is a grommet?

A grommet is like a giant cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All cords put to work

Each of the two grommets and every part of a grommet carry their share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

Better grip, less slip

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Send for proof

Send the coupon for a set of reports telling users' experiences and showing actual installations where grommet belts outlasted all others. Some typical cases:

"... within a few days ordinary belts had stretched ... After six months of 24-hour-a-day service BFG grommet belts haven't stretched at all ..."

"Ordinary belts lasted only 5 or 6 weeks ... B. F. Goodrich grommet belts are in their sixth month of service ..."

"Previous belts suffered from shock loads, wore out fast ... BFG grommet belts have been in service 2 years with no shut-downs..."

There are hundreds of cases like these.

They cost no more

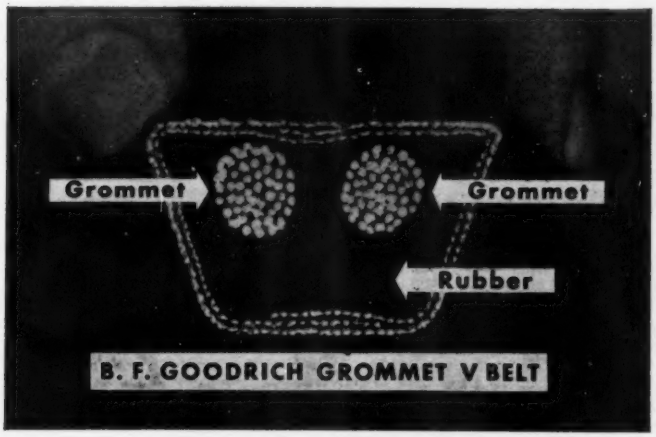
BFG grommet belts cost not one cent more than others. The savings they make for you are clear profit. They are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent No. 2,233,294).

Write, send the coupon or see your B. F. Goodrich distributor. (He will show you his "X-ray" belt that shows the grommet construction clearly.)

Grommet V-Belts BY

B.F.Goodrich

FIRST IN RUBBER



The B. F. Goodrich Company
Dept. PE-9
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt that shows how B. F. Goodrich grommet belts are made.

Name_____

Firm Name_____

_____

Street Address_____

City_____

State_____

can't burn out when stalled

Sensationally Different

KELLER Air Hoist

with positive displacement piston-type air motors

VARIABLE SPEED from 0 to 17 fpm permits safe handling of fragile loads. The load hook can be "inched" up or down for accurate spotting.

LIGHTWEIGHT—A 1,000-lb capacity hoist weighs only 30 lb—easy to carry up or down a ladder, and move from job to job.

DUST, FUMES cannot injure an air motor. Nor will it burn out, even if stalled all day long.

LOW MAINTENANCE because of simple design. Only a few working parts, and these are fully enclosed. Two grease fittings lubricate all working parts.

CONTINUOUS DUTY—Keller Air Hoists can be used continuously over periods of hours (or days) without danger of shortening motor life.

SEND FOR DETAILED INFORMATION

KELLER *Pneumatic Tools*

KELLER TOOL CO., GRAND HAVEN, MICH.

'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Schedule of Coming Events

THE EIGHTH Annual Meeting of the National Conference on Industrial Hydraulics will be held at the Hotel Sherman, Chicago, on September 4th and 5th.

The National Technical Conference of the Illuminating Engineering Society will be held at the Edgewater Beach Hotel from September 8th to 12th.

The Seventh National Chemical Exposition will be held at the Coliseum, Chicago, from September 9th through 13th.

The National Metal Exposition and Congress will be held at Philadelphia this year, from October 20th to 24th

The fifth Annual AIEE Machine Tool Conference will be held in Albany, New York, from October 29 to 31, 1952. Headquarters will be at the Hotel Ten Eyck, Albany.

Jeffrey Training Program

BECAUSE OF THE growing need for skilled engineers, The Jeffrey Manufacturing Co. has inaugurated a Student Training Program. Interested college graduates will be trained for responsible positions with the company.

According to L. H. McReynolds, the training program is open to both Juniors and Seniors. Men selected will be given a year's training and later assigned to specific divisions to which they are best fitted.

Any one wishing more information on this program should contact G. B. McNaughton, Director of Student Training, Industrial Engineering Division, The Jeffrey Manufacturing Co., Columbus 16, Ohio.

What About Testing Belt Lacings?

ON PAGES 48 and 50 of the May, 1952 issue of PLANT ENGINEERING Paul C. Ziemke points out that the lacing of leather drive belts is not a dead or lost art. I fully agree that "rawhide lacing" is still in use in quite a few places—but must remind him of the fact that there are but a few maintenance men who understand how to lace with rawhide.

They forget that a belt-lacing job must be scientifically constructed, balancing the strength of the rawhide against the thickness of the belt, and the size of holes against the net section of the belt.

Up until the year 1944, I had never seen nor ever heard of a test being made as to the strength of a rawhide laced joint, or any other kind of lacing, although there have been many arguments as to the actual strength of such lacings. Early in 1944, I persuaded the Clipper Belt Lacer Co. to make a test for me on a lock-stitch, rawhide-laced belt, comparing the strength of the rawhide laced joint, and the strength of a joint laced with their particular steel-hook laced joint.

The rawhide-laced joint failed at 2190 lb; No. 5 Clipper laced joint failed at 2250 lb; and No. 6 Clipper laced joint failed at 2625 lb. The above figures should tell the whole story to any person interested.

The knowledge that we gain during our travels should be made available to others for it is of no use to them if we hoard this knowledge. With the above in mind, I'll be only too glad to supply information on the above tests for the benefit of those readers who are interested. *Emil H. Petersen, Hotel El Rey, 511 East 6th St., Los Angeles 21, Calif.*

Editor's Note: Readers interested in this test study, please mark "Lacing Test" on post card in this issue.

Wooden Roof Bolts

A STUDY OF possible savings through use of wooden roof bolts in mines is described in a recent report by the Bureau of Mines.

Subject of the study was the Stony Point mine, Hopkins County, Ky., which produces some 3,000 tons of coal a day.

A copy of this study may be obtained by writing for Information Circular 7637, "Successful Use of Wooden Roof Bolts in the Stony Point Mine," in care of Publications Distribution Section, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

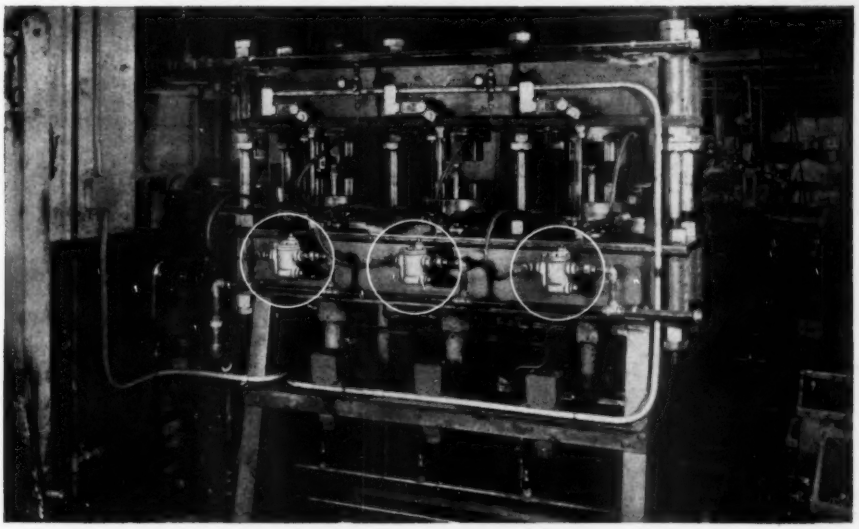
News of Plant Engineers Clubs

Baltimore: The May and June meetings of the Plant Engineers Club of Baltimore, following their inaugural meeting on April 8, this year, discussed the club constitution and by-laws proposed by committees. Revisions were suggested and the revised constitution and by-laws will be presented at the October meeting. The Club will get into full

(Continued on page 6)

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

Relies on Armstrong "Unit Trapping" to maintain molding press temperatures within ±5°F.



Uniform molding temperatures reduce leather cup rejects by 40%!

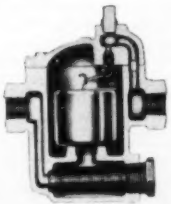
MANY a plant has accepted erratic temperatures of steam heated equipment as a necessary evil. Not so at Albert Trostel & Sons Company, Milwaukee, manufacturers of molded synthetic rubber and leather parts. They unhesitatingly replaced an electrically heated molding press, that varied in temperature as much as 30°F., with a steam heated press because they knew from previous experience that Armstrong Unit Trapping would give them uniform temperature control. Their confidence was not misplaced. An indivdual Armstrong steam trap on each station of the press keeps temperatures uniform within plus or minus 5°F. Molded leather cup rejects have been reduced by 40% and production greatly increased.

The benefits of Armstrong Unit Trapping are easy to understand. First, if you drain more than one unit with a single trap, any variation in pressure between the units will cause condensate and air from a higher pressure unit to block drainage from a slightly lower pressure unit or section. With an individual trap on each unit this cannot happen. Secondly, Armstrong traps discharge condensate and air as fast as they accumulate so that every unit is always full of hot dry steam and, hence, at maximum temperature.

Let your local Armstrong Representative look over your condensate drainage system—he sells Armstrong traps under a *satisfaction-or-your-money-back guarantee.* Call him or write:

ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

BONUS VALUE



Built-in Strainer Trap Saves Money, Maintenance

Small traps need strainer protection against dirt and scale. Howard Knoller, V.P. & Plant Engineer of Albert Trostel & Sons Company, uses and likes Armstrong No. 880 traps with built-in strainers because: they cost less than a trap plus separate strainer; save fittings and installation labor, and the strainer can be cleaned without removing trap or shutting off steam.

You Always Get Greater Efficiency When You Use Armstrong Unit Trapping

FREE
44-PAGE STEAM TRAP BOOK
Gives Complete Data

FILL IN AND CLIP TO YOUR COMPANY LETTERHEAD

ARMSTRONG MACHINE WORKS
912 Maple Street, Three Rivers, Michigan

Please send me The Steam Trap Book.

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News of Plant Engineers Clubs

(Continued from page 4)

swing, beginning with the fall meeting to be held in October.

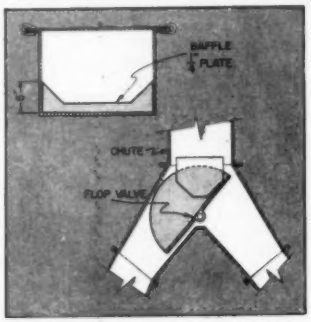
Any potential members in or near the Baltimore area who are interested in joining the Club and possibly attending the October meeting, should contact **A. D. Field,** Plant Engineer, Bethlehem-Sparrows Points Shipyard, Inc., Sparrows Point 19, Maryland.

Calumet: The fall meeting of the Plant Engineers of the Calumet Region will be held on Tuesday, September 15th at Phil Smidts, Hammond, Indiana. The subject talk for the evening will be on lubrication.

Plant engineers interested in hearing more about the activities of the Calumet Group should contact **Otto J. Seidl,** Asst. Plant Engineer, Combustion-Superheater, Inc., East Chicago Div., 425 W. 151st St., East Chicago, Indiana.

Improved Design for Baffles

PROMPTED BY THE publication of the winning entry in the June PLANgineering Contest, G. E. Stone, Plant Engineer at Basic Refractories, Inc., Maple Grove, Ohio,



Shown is an improved design suggested for the baffles used in channeling the flow of bulk materials in the chutes

presents an improved design for the baffles used in channeling the flow of bulk materials in chutes. In this design, the wings on the baffles tend to protect the sides of the chute as well as the bottom.

In addition to this information, Mr. Stone submitted the design of the non-leaking flop valve used to direct flow in chute systems.

In his comments on the handling of bulk materials, the importance of wear reduction in chutes was proposed as the subject of a study by PLANT ENGINEERING.

Plant engineers are requested to participate in this study. Those who have effected a complete or partial solution to this abrasive wear problem are urged to submit their ideas to the Editor for incorporation into a summary article similar to that published in the July, 1952 issue of PLANT ENGINEERING, entitled, "Scrap-Handling Problems," which appears on page 94.

'ROUND ABOUT

A Pat on the Back

DEAR EDITOR: PLANT ENGINEERING must give the editorial department a sense of doing a task well. The magazine provides us with a medium for exchange of ideas and thereby becomes a factor in the productive capacity and efficiency of our great American industrial enterprise. *A. J. Schuler, Chief Engineer, U.S.S. Lead Refinery, Inc., East Chicago, Indiana.*

WE HAVE BEEN particularly impressed with the continued growth in size and editorial quality of PLANT ENGINEERING since its beginning. I feel that the editorial content more nearly fills the needs of Plant Engineers than any other magazine being published. *Robert J. Tucker, Jr., Plant Engineer, Patterson Mills Co., Roanoke Rapids, North Carolina.*

Personnel Changes

George F. Hodgson has been appointed to the position of general plant engineer of the Batavia, N. Y., plant of Doehler-Jarvis Corp.

A. Babillis, manager—plant engineering and maintenance facilities at General Electric's Pittsfield, Mass., works, has announced the appointments of **David R. Pryde** as plant engineer of the general plant facilities operation; and **Rudolph G. Sarna,** as superintendent of plant maintenance and construction.

Would You Like to Be an Editor? We Need Another on Our Staff!

THERE IS an opening on Technical Publishing Co's. editorial staff for a young man of about 30 yr of age who has a good personality and common sense and who likes to meet people, travel and write. He does not have to be a gifted author but must be able to write clear and concise English. He should have: an engineering education; and experience in plant maintenance and power engineering. If you qualify write (strictly confidential) The Editor, PLANT ENGINEERING, 110 South Dearborn Street, Chicago, Illinois.

MATHIESON CHEMICAL CORPORATION'S new plant at Doe Run, Kentucky, engineered and constructed by BADGER Process Division, Stone & Webster Engineering Corporation.

...and using the OIC

LONG LINE OF VALVES

OIC builds valves for every purpose—cast and forged steel, iron and bronze—and every valve is *precision-engineered* and *precision-made* to give longer, trouble-free service at no extra cost to you. OIC offers *precision-application* help in selecting valves best suited to each job.

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WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES

FORGED AND CAST STEEL • IRON • BRONZE

Don't Bargain-Shop for Service . . .

It takes *more* than on-the-spot repair to provide sound maintenance for heavy electrical equipment. *Real* service economy comes when Field Repair is *coupled* with Field Inspection—handled by factory specialists who will catch potential trouble early . . . take protective steps now. This combination is *Field Service.*

This is why Westinghouse operates 46 Field Service offices, and staffs them with experienced apparatus engineers. Through them, a part of the headquarters factory moves into your plant to inspect and test, adjust or repair your apparatus . . . and recommend major overhauls when they are needed. These engineers use the most modern repair and testing equipment. They can do the entire job—or will work with your own personnel.

Field Service, however, is only one phase of a *complete* maintenance program offered by Westinghouse. It also operates 31 Renewal Parts Warehouses, stocked with precision-built parts . . . plus a network of 36 Repair Plants, expertly manned and equipped for *all* types of electrical apparatus repairs.

CALL WESTINGHOUSE FOR A COMPLETE MAINTENANCE SERVICE

Field repair alone . . . is not enough !

These services are backed by factory-tested methods, factory-approved materials, factory-trained specialists. They offer the finest in *service protection* . . . the best in *service economy.* Your proof is in the performance of the completed job.

For more information, write today for a free copy of Westinghouse Maintenance Booklet, B-4766.

It's loaded with facts and illustrations covering the complete Westinghouse Maintenance Service. Send your request to: Maintenance Sales Dept., Westinghouse Electric Corp., East Pittsburgh, Pennsylvania. J-95159

...MATCHED TO YOUR NEEDS

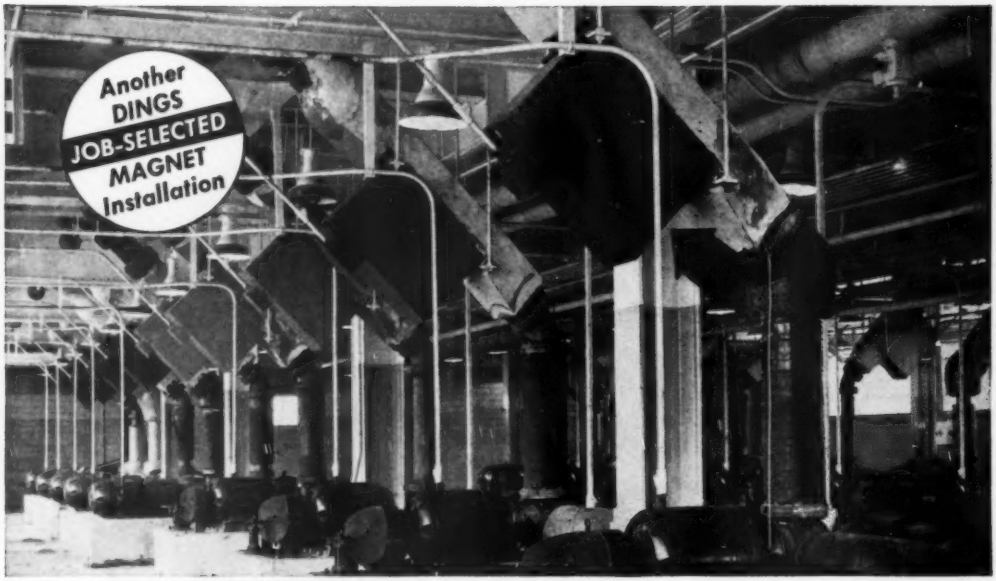
YOU CAN BE **SURE**...IF IT'S

Westinghouse

COMPLETE MAINTENANCE SERVICE

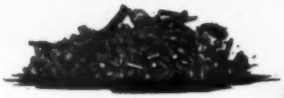
SHOP REPAIR FIELD SERVICE

GENUINE RENEWAL PARTS



Threat to $33,000 Removed by Dings Magnets

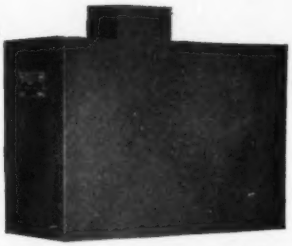
Acetate Plant Gets Surprise; Unloads 20 lbs. of Iron



A chemical pump has no palate for iron—a single nut or bolt can wreck it. When a large acetate plant installed 30 Dings watertight rectangular electro-magnets—one ahead of each pump—they were protection conscious—said they'd be surprised and satisfied if the whole battery found one or two bolts total. In 4 months, the Dings Magnets extracted over 20 lbs. of tramp iron . . . enough to wreck all thirty pumps . . . $33,000 worth!

This plant achieved its objective to a degree beyond expectations. Three factors were responsible: (1) applying exactly the right magnet for the job; (2) the magnet itself was highly engineered and quality built; and (3) the magnet was correctly installed. Whatever *your* tramp iron problem, those are the things you buy when you buy a Dings "Job Selected" Magnet. Investigate today.

Dings Magnetic Separator Company
4746 W. Electric Ave., Milwaukee 46, Wis.
World's Largest Exclusive Builder of Magnetic Separators



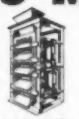
THIS IS THE TYPE THAT DID THE JOB. *The magnet that fit this job best is a Dings Rectangular (electro), a particularly versatile magnet which is effective at distances up to 18". Its triple pole design makes it effective on the most difficult jobs; fast moving conveyor belts, wet, sticky material, etc. Can be adapted in any number of ways to suit particular requirements. Catalog 301-A gives details.*

This Catalog Helps You to "Job Select" a Magnet
Is the material you want de-ironed solid . . . semi-solid . . . liquid? Is it carried in chutes . . . ducts . . . conveyor belts? Catalog 5000-B lists Dings complete line by application, describes all Dings magnets from the low cost, non-electric "Perma" Plate magnet to the most powerful magnetic separators known. Send for it today.

DINGS MAGNETS

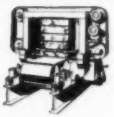
OTHER DINGS MAGNETS

Non-Electric Plates


High Intensity Induced Roll

Non-Electric and Electric Pulleys

Non-Electric Drums


High Intensity Type EBK Crossbelt

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Now — one multi-purpose Grease will handle virtually all your Grease Requirements!

Reduced inventory . . . less chance for error in application . . . savings in maintenance. These are but three of the big benefits you get with Gargoyle Grease BRB No. 1.

This single, multi-purpose grease will provide correct lubrication for practically all normally loaded anti-friction and plain bearings in the average industrial plant. It resists leakage and "wash out," protects against rust and corrosion, lasts many times longer in anti-friction bearings than conventional greases.

Why use more than the one grease when one will do? Call your Socony-Vacuum representative.

Send for informative pamphlet about Gargoyle Grease BRB No. 1. Write to Socony-Vacuum Oil Company, Inc., 26 Broadway, New York 4, N. Y.

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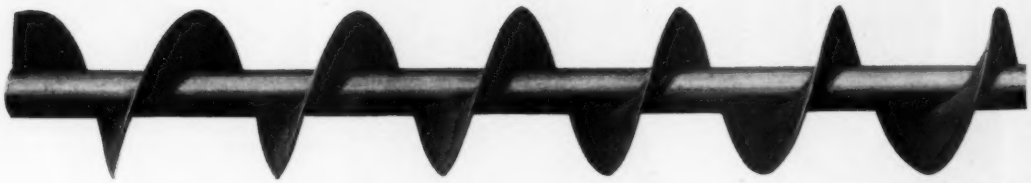
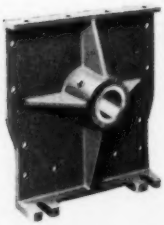
conveyors

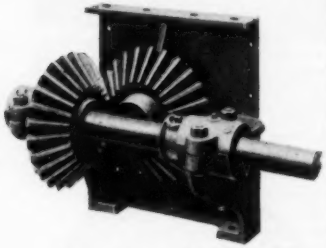
Sectional Conveyor Flight



Helicoid Flight



Plain trough end bearing (outside type) with feet. Babbitted bearings are standard. Bronze or other types of journal bearings can be furnished.



Open type countershaft end bearing. Can be furnished with driving gear and shaft extension at right or left. Babbitted bearings standard.

A COMPLETE LINE OF FLIGHTS AND ACCESSORIES

for New and Replacement Service

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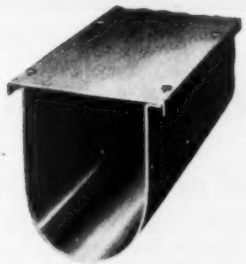
Catalog No. 803-B

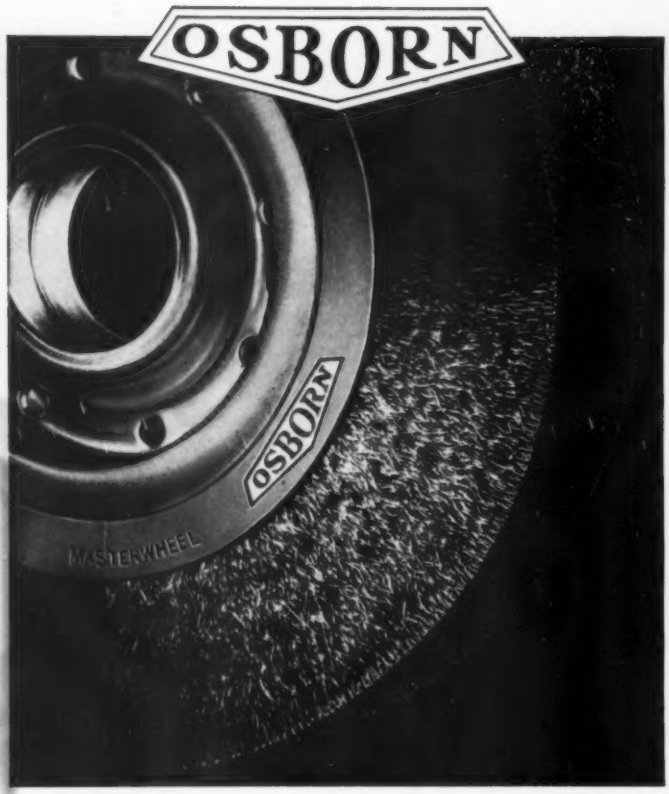
No. 18-B Hanger for light and medium service. Various types available depending upon material, style of trough, temperature of material and volume to be handled



Section of standard steel conveyor trough showing cover with T-head bolts. Other types — with clamps or sand seals — available.

THE JEFFREY MANUFACTURING COMPANY

1877 75 1952



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FOR ALL YOUR NEEDS. There's an OSBORN brush for every industrial brushing need and your INDUSTRIAL DISTRIBUTOR . . . as handy as your phone . . . is ready to serve you promptly. Call him for paint brushes, maintenance brushes, power brushes.

Want to get rid of red tape?

Get on the BRAND Wagon! Buy leading BRANDS of industrial supplies from your trusted INDUSTRIAL DISTRIBUTOR. It's simple! No need to shop around. Just "Mass Purchase" routine supplies automatically, *all on one order,* from your INDUSTRIAL DISTRIBUTOR. You cut red tape and get good service and unsurpassed dollar value.

The leading BRAND in industrial brushes since 1892 is OSBORN. Specify OSBORN maintenance, power and paint brushes and order them along with other industrial supplies . . . all on one order. Saves time! Saves money! *The Osborn Manufacturing Company, Dept. 823, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

EASY TO BUY. You can make one order cover OSBORN Brushes and other leading-brand industrial supplies when you buy from your INDUSTRIAL DISTRIBUTOR. This automatic procedure streamlines your purchasing, cuts red tape and gives you nationally accepted, known-quality brands.

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Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

NUMBER 5 OF A SERIES

How Gulf Periodic Consultation Service

helps plants cut lubrication and maintenance costs

PERIODIC SERVICE CALLS
KEEP PROGRAM CONTINUOUS AND UP TO DATE

When you adopt Gulf Periodic Consultation Service, Gulf Sales and Staff Engineers will help you set up a complete lubrication program—the kind of a program that has reduced maintenance costs in scores of plants.

These trained specialists will survey your equipment, provide simplified charts with practical lubricant recommendations, and suggest better application methods. They will also provide expert assistance on special problems that involve lubricants or lubrication.

Then, to keep the program up to date, they will make periodic service calls at your plant. On the occasion of these calls, they will note changed operating conditions that might affect the lubrication program. They will advise you regarding new developments in lubrication practice. And they will look for further means of reducing costs through improved lubrication.

Mail the coupon below for additional information on this cooperative plan. Or contact your nearest Gulf office.

GULF SERVES INDUSTRY

Gulf Oil Corporation · Gulf Refining Company PE
719 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of the booklet "Gulf Periodic Consultation Service."

Name.....

Company.....

Title.....

Address.....

Ask Yourself:

1 ***Do we have hand operations that could be mechanized?***

2 ***Is inferior mechanization hampering any operation?***

3 ***Can we use a greater degree of automatic control?***

4 ***Could we combine several operations into a continuous process?***

If your answer is yes, then you are not producing as fast and efficiently as you can

. . . and the immediate importance of your answer is this: from now on, your success as a manufacturer will depend more and more upon the degree of mechanization in your plant.

Too often, today, advances in mechanization are confined to breaking a production bottleneck, or matching a competitive process.

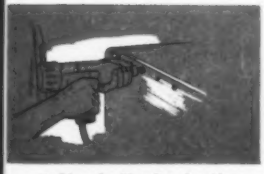
Let's look a bit further—at replacing these sporadic improvements with a *planned* mechanization program.

The results are cumulative. Progressively, each operation is lifted to a higher level of mechanization on a sound economic schedule.

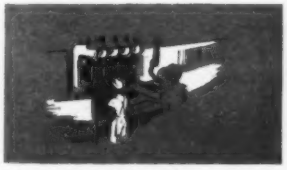
You are insured against tomorrow's competition. Manpower and scarce materials are conserved. Your profit position is strengthened.

To help you plan your mechanization, General Electric offers a new guide. We call it "Progressive Mechanization." It's a "More Power to America" program—another way to increase industrial productivity by spreading the knowledge of modern industrial techniques.

HERE ARE THE FOUR STAGES OF PROGRESSIVE MECHANIZATION



1 Simple Mechanization—simple machines driven by power—like this electric tool.

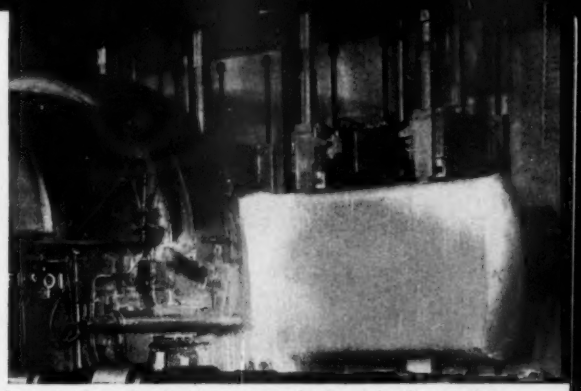


2 Improved Mechanization—more complex, like this drilling machine. Motors and controls aid manual operations.

3 Automatic Control—machines that have adjustable-speed with "push-button control," like an automatic welder.

4 Continuous Process—machines co-ordinated for "start-to-finish" production.

Simple mechanization—example: Lightweight electric impact tool tightens nuts in 1/10 the time a hand wrench takes.



Improved mechanization—example: Special milling machine replaces lighter type—"scalps" aluminum billets 5' wide 10' long.

Automatic control—example: Adjustable-speed beer-can filling machine will change rate of production to meet any condition.

Continuous process—example: 216 operations are made on cylinder block in 36 seconds by automatic-transfer-type machine.

How you can improve production in your plant with the G-E Progressive Mechanization Program

START OFF with a "launching ceremony"—have all of your engineers and key people see the full-color movie "Motors in Industry." You'll drive home to them the importance of improving mechanization in your plant.

This informative film has more than 40 interesting mechanization case histories. Shots from four of them are pictured above. They are just a few of the examples that you can use to stimulate interest in mechanizing *progressively*.

CHANNEL THIS INTEREST—do some practical, organized probing into your present production methods. General Electric's Progressive Mechanization manual may help show you the way. Hand out the special mechanization survey forms. You can use them to enlist the participation of as many persons as you wish, including the men "at the bench."

WANT TO LEARN MORE? You get a free copy of the Progressive Mechanization manual, and indicate interest in seeing "Motors in Industry," just by sending in the coupon below. Or contact your nearest G-E Apparatus Sales Office.

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Back up your Mechanization Program with the G-E Motor Selection Course

Here's a complete course, covering the fundamentals of motors now available. It explains how to select and supply motors, what sort of control to use. Your local G-E representative can make arrangements for you to use this course.

MORE POWER TO AMERICA programs are guides to increase the efficiency of American Industry. They stimulate wider, more efficient use of electricity in production.

. . . . . .

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I'm interested in:

- ☐ A free copy of the Progressive Mechanization manual.
- ☐ Seeing the motion picture on Progressive Mechanization.
- ☐ Using the "Motor Selection & Application Course."

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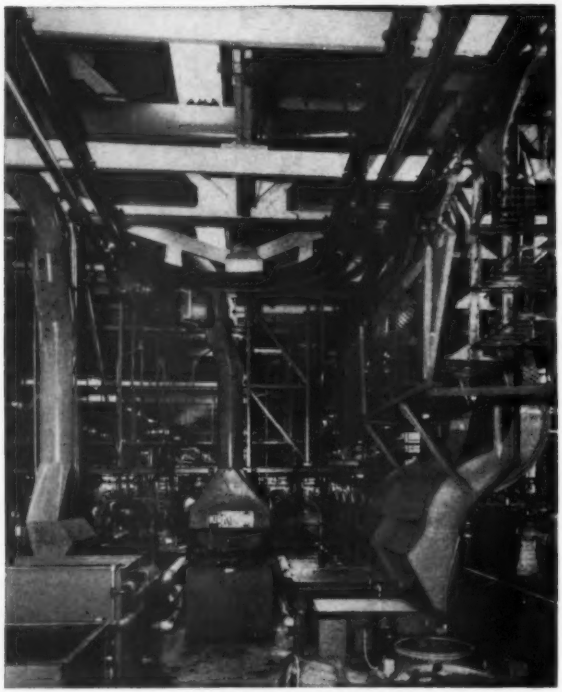
THE INVISIBLE TOOL

at work in the

FORD AUTOMATIC TRANSMISSION PLANT

NUMBER 4 OF A SERIES

KIRK AND BLUM Systems Remove Steam and Chemical Vapors in Cleaning



Cleaning tanks in the Finish Grinding Department of the Ford Automatic Transmission plant. These five tanks are fitted with KIRK & BLUM modified lateral cross draft hoods, which remove fumes below the operator's breathing level.

The fumes of chlorinated solvents as well as steam and water vapor from heated soak tanks and washing machines are controlled in this plant by KIRK & BLUM Systems. As shown here, a number of fume collecting points are piped to a ceiling-mounted fan which exhausts outside the plant. Make-up air is furnished by another KIRK & BLUM System.

In the ultra-modern Ford Motor Company Automatic Transmission Plant, 37 distinct KIRK & BLUM Systems aid in the production of Merc-o-Matic and Ford-o-Matic transmissions. In heat treating, quenching, welding, cleaning, machining, woodworking, maintenance and assembly operation, they provide "Clean Air . . . the INVISIBLE Tool" in this model plant.

Let the experience of KIRK & BLUM engineers work for you. Write for literature. The Kirk & Blum Manufacturing Co., 3189 Forrer St., Cincinnati 9, Ohio.

KIRK AND BLUM

FUME CONTROL SYSTEMS

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Engineered to save maintenance manhours

Scrappy says, "Aid defense—more scrap today... more steel tomorrow."

Write Dept. D-9 for free booklet giving Dimensional Data on types, sizes and materials of TUBE-TURN Welding Fittings and Flanges.

THIS TUBE-TURN WELDING ELBOW is engineered for shape, size, dimension, and wall thickness . . . to provide you with permanent, leakproof piping. It is forged by the only process that produces a wall as uniform in thickness and true in circularity as the original seamless pipe . . . guaranteeing accurate fit-up and *full strength throughout.*

More than ever, any piping installation you make should be maintenance-free, and have extra long life . . . that's why it pays to *specify* TUBE-TURN Welding Fittings and Flanges. For good service call on your nearby TUBE TURNS' Distributor . . . you'll find one in every principal city.

Be sure you see the double "tt"

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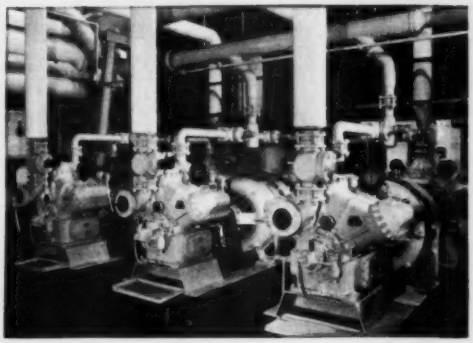
DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles

TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO... A wholly owned subsidiary of TUBE TURNS, INC.

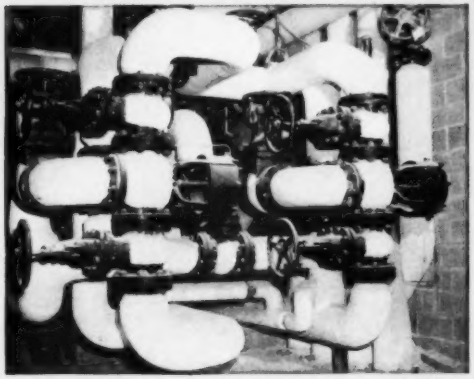
HOW LARGE BUILDINGS CUT MAINTENANCE

Large buildings cut maintenance with welded piping ...using TUBE-TURN Welding Fittings

FAMOUS HOTEL—New York's Waldorf Asteria uses 160,000,000 pounds of steam annually . . . and has the most extensive air conditioning system in the world. For top efficiency, all main lines, such as this piping to a steam header, are welded. Directional changes are made with TUBE-TURN Welding Fittings. All necessary types of welding fittings for any job, large or small, can be obtained from TUBE TURNS, INC. . . . which offers the world's broadest line of welding fittings and flanges, in a wide range of types, sizes, and more than 40 different alloys.



DEPARTMENT STORE—Long known for progressiveness in the retail field, the Lazarus Company was one of the first to air condition its selling areas. Facilities have since been extended to all 32 acres of floor space. To keep maintenance to a minimum, an all-welded piping system, using reliable TUBE-TURN Welding Fittings and Flanges, was specified for refrigeration equipment, condensers, pumps, etc. Thus joints are permanently leakproof, and insulation is on for life.



HOSPITAL—All piping from 2" up, for new addition to Mount Carmel Hospital in Columbus, Ohio, is welded, with TUBE-TURN Welding Fittings specified throughout. In this maze of steam piping to a hot water converter, welded piping fits neatly into a small space. With no flanges to work around, insulation was applied easily. This leakproof piping system eliminates the danger of interruption of vital services.

TUBE TURNS, INC., Dept. D-9
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FLUID DRIVE
3 to 8 times longer clutch life

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waterproofed and built for rugged, constant service

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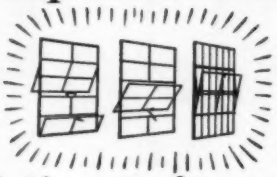
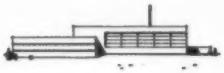
You can save big money by eliminating maintenance-painting . . . and have windows that are really rugged, rigid and strong . . . by specifying *Fenestra*® Super Hot-Dip Galvanized Steel Windows  for that new  building of yours. Write Detroit Steel Products Company, Dept. PE-9, 2280 East Grand Blvd., Detroit 11, Michigan, for the story

on how strong, steel *Fenestra* Windows stay

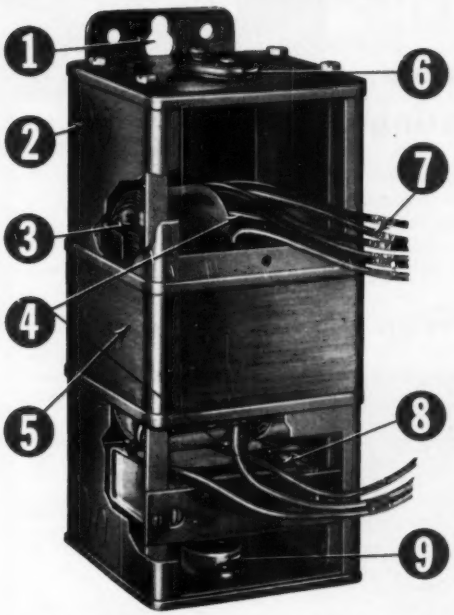
BETTER - *Nine Ways*

FOR INDOOR MERCURY LAMP OPERATION

Only

JEFFERSON

TRANSFORMERS *have ALL these EXTRA-VALUE FEATURES*



1 EASY MOUNTING! Top and bottom brackets have keyhole slots for easy positioning and two holes for locking bolts. Brackets are removable or reversible for messenger wire suspension, etc.

2 PLENTY OF KNOCKOUTS! One-half and ¾" knockouts in sides of wiring compartments at each end. Two ½" knockouts in each end plate.

3 DOUBLE VARNISHED CORE AND COIL! Oven baked polymerizing varnish impregnation assures permanent insulation and protection against moisture.

4 INCANDESCENT & MERCURY LAMP LEADS, BOTH ENDS! For fast and convenient wiring of combination mercury vapor and incandescent lamp fixtures. Mercury lamps can also be wired from either end of transformer.

5 PRESS FIT RIVETED CORE! For positive uniformity of manufacture and maximum quality.

6 INTERCHANGEABLE FITTINGS! Pryouts on both ends expose standard ½" conduit fittings for suspension type mounting of transformer and/or lamp. ¾" fittings quickly interchangeable.

7 THREE PRIMARY TAPS! Color-coded tagged leads for positive identification and quick wiring. Three primary taps (not just two) for close matching with line voltage, and maximum lamp and transformer performance.

8 AMPLE WIRING COMPARTMENTS! Condenser located to allow ample wiring space when any knockout is used. Condenser is solidly mounted to prevent damage by vibration to condenser and leads.

9 NO OBSTRUCTIONS! Plenty of room between condenser and conduit fittings to run wiring through lamp suspension conduit. Save time, trouble, and outside wiring. End cover knockouts are completely free of obstructions for quicker installations.

You find *all* the extra-values *only* in the newly revised line of Jefferson Transformers. Every feature vital to top-flight service, economy, and ideal lamp performance is built-in to give you unmatched value in every detail.

Get the most out of your mercury lamp installations by insisting on Jefferson Transformers. They operate all H-1 400 watt mercury lamps. Models are available for all indoor and outdoor applications. Underwriters' Laboratories approved.

Write for 16-page illustrated Bulletin 521-5 now.

The Jefferson line also includes the finest transformers for both H-12 and H-13 1000 watt mercury lamps.

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

Jefferson JEFFERSON ELECTRIC *Transformers*

5 REASONS WHY

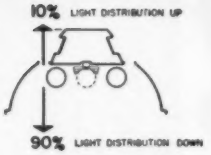
New CFI DAY-LINE

Guarantees More Comfortable, More Productive Plant Lighting

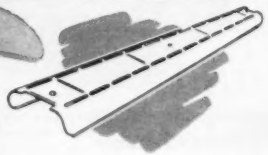
To give industry the comfortable, vision-saving illumination it needs, Day-Brite has completely redesigned its famous Day-Line industrial line. Now—for the first time—industry can have the strong, sturdy construction it needs plus the most important advance in plant lighting in years—10% upward component to provide "comfort for industry."

CFI MEANS COMFORT FOR INDUSTRY

These Features Make the Difference!



10% UPWARD LIGHT — Eliminates harsh brightness contrasts and dark ceilings that can result in irritation or nervous fatigue due to eyestrain. Workers see better, produce more. Two years of exhaustive research by Day-Brite engineers have proven 10% upward, 90% downward distribution of light is the most practical for industrials.



ALL-WHITE PORCELAIN ENAMEL REFLECTORS—Outside as well as inside—further improve the efficiency of the upward component. Embossed apertures are scientifically sized and placed to achieve 10% upward light distribution and still retain the famous Day-Brite strength and rigidity needed for the toughest installation conditions.

LOWER COST—Yet with all the advantages you get with the new CFI DAY-LINE, prices are substantially lower! Better lighting at less cost! Day-Brite Lighting, Inc., 5439 Bulwer Avenue, St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

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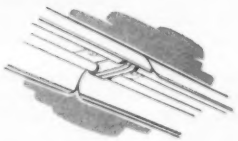
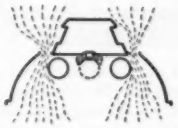


VIBRATION-PROOF TURRET* SOCKETS are standard on all CFI DAY-LINE industrials, including the 85-watt fluorescent lamp units. These finest of all heavy-duty sockets give you positive lamp seating and allow trouble-free lamp mounting. Servicing is quicker and easier.

* ® G. E. Co.



COOLER, CLEANER PERFORMANCE—Constant air-flow through the apertures, around the lamps, and over the inside and outside of the reflector keeps CFI DAY-LINE fixtures cooler, more efficient . . . and reduces light loss due to dust and dirt deposits. Circulating air keeps reflectors cleaner . . . longer.

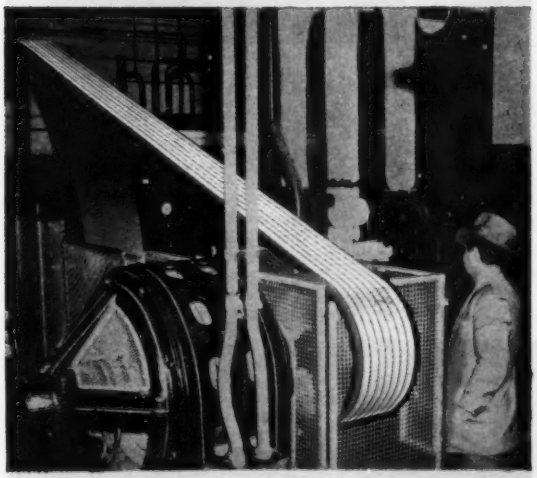
Distributed Nationally by Leading Electrical Wholesalers

How concave sides cut V-Belt costs

Important to anyone who wants to cut V-Belt replacement costs is the simple, interesting reason WHY Gates Vulco Ropes are built with *Concave Sides* (U. S. Patent 1813698). See Figure 1.

When a Gates belt is bent around a sheave these Concave Sides fill out to full, even contact with the sides of the sheave groove. (Figure 1A). This gives you sure pulling power. And, naturally, because wear is distributed evenly, the Concave Sides actually give you longer wear—longer belt life. That cuts V-Belt replacement costs.

On the other hand, when a straight sided V-Belt (Figure 2) is bent, the sides bulge out, preventing the belt from fitting evenly in the sheave groove. This causes *extra wear* at the points shown by arrows. (Figure 2A).



Make this simple test yourself...

Hold a straight sided V-Belt as it would be bent around a sheave. Take the sides of the belt between your finger and thumb. You can *feel* the bulges in the sides—the bulges that prevent an even fit in the sheave groove and cause extra wear.

Now do the same thing with a Gates Vulco Rope. You can feel the sides fill out. You can see why they press firmly and evenly against the sides of the sheave groove—giving you longer belt life—lower belt costs.

When you buy V-Belts be sure to get Gates Vulco Ropes—the V-Belts with the Concave Sides.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

SAVING $1,000 A YEAR

This big 18 foot flywheel on an ammonia compressor at the Terminal Warehouse Co., St. Joseph, Missouri, was originally driven by a flat belt.

Mr. I. McKee, plant superintendent says, "We needed a drive we could depend on, so we installed a Gates Vulco Rope drive right on the flat pulley of the compressor. This conversion is saving us about $1,000 a year."

CS-526-A

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts—Hose
Molded Rubber Goods for industry
World's Largest Maker of V-Belts

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Skip Hoist for Boiler Refuse

SOME 10,000 TONS of coal per year are consumed by boilers at the So. Dakota State College. The peak load is during the dead of winter when from 40 to 50 tons are burned a day. In "the old days" removal of the ash from such an operation would be a tedious and dusty job. Now, however, this job is handled with speed and ease with the aid of a single drum hoist.

Ashes from the 4 boilers in the college's boiler room are dumped directly into a steel hopper equipped with flanged wheels. This container rests on a flat car which is trundled along the tracks to the foot of the ash hopper tower. At this point the loaded container is hooked to a hoisting line.

It is then dragged up a set of tracks to a storage hopper. No switching or extra handling is needed as the wheels on the side of the small hopper align easily with vertical tracks. These are set at a slight angle to maintain the small vehicle on the track.

A speed reducer on the hoist provides for a line speed of only 40 to 50 fpm. The pace assures against an overrun at the top of the track and prevents an unevenly loaded bucket from jumping the track.

Operator controls hoist as it pulls ash container from flat car to the tower

Ashes stored in the big hopper are hauled away once or twice a day by truck, which is loaded by gravity directly from the hopper. Thus, with the hoist and hopper, ash handling is made simple and light. *From the American Crosby Clipper, published by American Hoist and Derrick Co., St. Paul, Minn.*

Care of Paint Brushes

TO KEEP a paint brush in good shape, clean paint or enamel from it after each use. Work it out in mineral spirits or turpentine. Do not press the brush down endwise as this will force it out of shape. Work the solvent well into the heel.

To remove paint clinging to the bristles, lay the brush flat on a board and scrape the bristles with a blunt putty knife. Work again in the solvent and scrub out the loose paint with a stubby 1 in. brush. Rinse again in thinner and spin by hand to remove all liquid. Then transfer the brush to clean thinner and rinse out as much as possible.

After the brush has been cleaned, suspend it in raw linseed oil by hanging it from the handle. It is best to wrap it in heavy paper before suspending it. When the brush is to be used again, remove the wrapper and spin to remove the linseed oil. Then rinse in paint thinner.

Do not clean a paint brush with paint remover or diesel oil. These materials will ruin it. And do not throw away used brushes because good quality brushes are expensive.

A paint brush has an "Achilles heel." This is the portion of the bristles adjacent to the metal band called the ferrule. Do not attack it in this vulnerable spot. In painting, dip the clean brush only a short way into the paint to avoid getting it into the heel, where it will accumulate and cause all kinds of trouble.

Do not use a good brush endwise in pinch-tight corners, recesses and the like. This practice rounds out

Chemically Treated Tissues Prevent Water Stains from Forming on Stacked Aluminum Sheets

RESEARCH SCIENTISTS in Kaiser's Spokane laboratories have discovered a way to protect aluminum from water stains which occasionally develop on the surfaces of stacked flat sheet as a result of moisture condensation during storage.

Although water stains do not affect the mechanical properties of aluminum they mar the naturally pleasing appearance of the metal.

A series of experiments was performed by W. Y. Beakley of the research division to find a chemical compound which would prevent water staining. His idea was to impregnate the interleaving tissues used in unoiled packages with an inhibitor compound that would protect the metal. He found that certain chromate compounds could do the job, and do it better than any of the other compounds he tested.

Highly accelerated hot-cold treatment produced water stains on unprotected sheets. Sodium chromate tissue kept sheet on right in bright and shiny condition

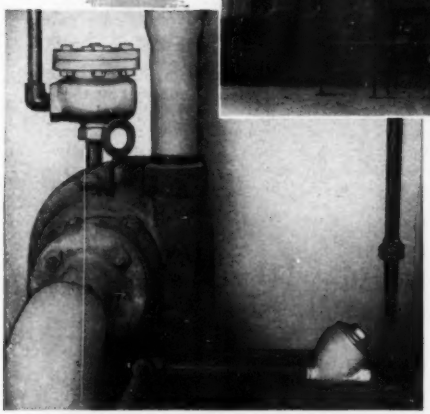
The shipping department of the Trentwood rolling mill joined in further testing of the treated tissues. Special commercial size stacks of flat sheet were prepared using chromate tissues, ordinary tissues, and no tissues at all.

These stacks were then alternately stored in a refrigerator and a room as moist and warm as a Turkish bath. This procedure represented the extreme conditions necessary to promote water staining.

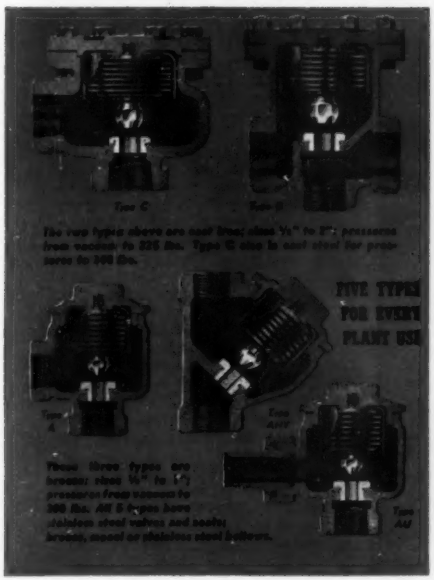
When the packages were examined, the aluminum sheets which were interleaved with properly chromated tissues were found to be as free from blemishes as they were before they first entered the refrigerator. The unprotected sheets showed the familiar water stains which had been encountered in the laboratory tests.

It is possible that further evaluation of these tissues may show them to be effective in preventing water stains on other materials. *From Kaiser Aluminum News, published by Kaiser Aluminum and Chemical Corp., Oakland, Calif.*

NICHOLSON TRAPS SELECTED FOR *Celanese* STEAM PLANT



Above, enlarged steam generating facilities of the Celanese Corporation of America plant at Hopewell, Va., now in an extensive expansion program. Specified were Nicholson Steam Traps, two of which are shown at left.



How to use modern equipment to bring the steam generating capacity of a boilerhouse up to the needs of an extensive plant expansion program was recently demonstrated by Celanese Corporation of America at its Hopewell, Va., textile plant.

Stoker equipment to fit present space, and auxiliary equipment of the most modern nature -- all were selected with a view to attaining maximum efficiency, and desired capacity with a margin of space for further expansion. Nicholson Steam Traps were installed in connection with a new piping system which features return of the condensate and reclamation of most of its heat.

A recent survey showed these Nicholson features to be reasons why an increasing number of leading plants are standardizing on Nicholson thermostatic traps: 2 to 6 times average drainage capacity; shorten heat-up time. Operate at lower temperature differential; fast action keeps equipment full of live steam. Maximum air-venting capacity. Types for every process, power and heat application.

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A 32-page standard reference; contains installation diagrams and data for determining proper size of trap.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 24)

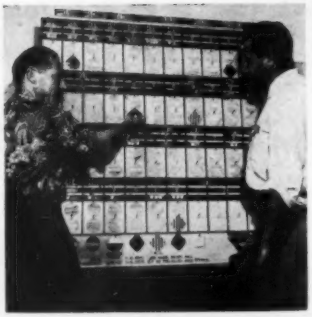
the corners and causes the brush to "finger" making it useless for cutting in sharp lines. *From Tech. Publication No. 17, Navy Dept., Bureau of Ships, Washington, D. C.*

Machine Control Board

LEADMEN AND MACHINE operators at Lockheed's Burbank plant on occasion had to dig through a batch of paperwork in order to find out what job was scheduled for some particular machine.

It was decided by one of the employees that a big master control board would offer immediate visual information on machine status. This idea became a reality. With the cooperation of one of the foremen refinements were added to the board to make it more effective.

Each small rectangular section on the board represents a machine.



One of two tags on a specific machine is held by board inventor. Workloads on machines are shown by colored tags

Within this area are found two nails for the purpose of holding tags. The upper tag shows an operation in progress and the lower one indicates the operation that will follow.

Thus jobs coming up can be made ready in advance and scheduled more accurately. If a machine is due for maintenance or other work following an operation, a different colored tag is hung on the lower hook.

The new boards bring with them not only a possible saving in many man-hours but also a potential saving up to 180 machine-hours per month. It is reported that these boards almost completely eliminate machine schedule confusion within a section. *From the Lockheed Star, published by the Lockheed Aircraft Corp., Burbank, Calif.*

Gages Eliminate Drilling

THE ABILITY to measure the thickness of walls of boilers and pressure vessels without drilling holes is an important advantage in modern accident prevention maintenance. Electronic and ultrasonic vibration instruments are being used.

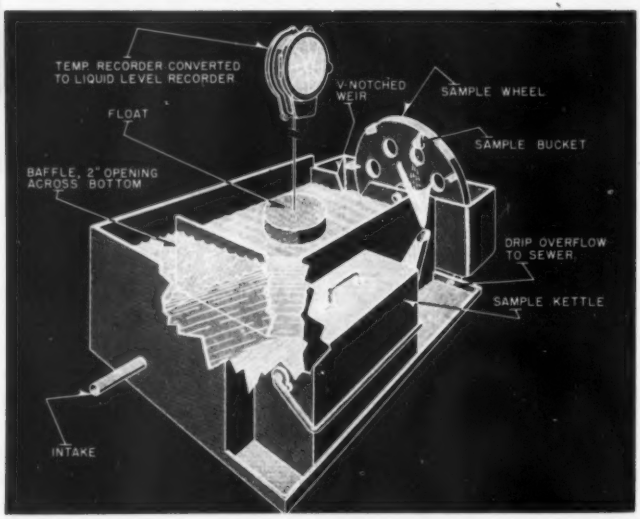
While there are a number of instruments available for plate thickness measurements, Mutual Boiler has had experience with only two types of non-destructive thickness testing gages.

The basic principle of ultrasonic vibration is used in one of these instruments. Sound waves at ultrasonic frequencies are transmitted into the metal to be tested by applying a mechanically vibrating quartz crystal to the metal surface. The

Material Balance Closely Kept with Aid of Measuring Unit Equipped with Liquid Level Recorder

SUCCESSFUL OPERATION of a chemical process demands an accurate accounting of the consumption of all materials. Material balance of caustic soda in our plant required a measurement within 0.5 per cent accuracy of the continuous flow of waste soda from a battery of dialysers. These handle from 500,000 to 600,000 gallons of impure solution per month with a recovery efficiency of 90 per cent or better.

To help keep track of waste soda, a measuring unit was devised. This was assembled and installed by maintenance personnel. The device has permitted the yearly soda caustic balance of the plant to be accurate to within 0.2 per cent.



Maintenance personnel assembled and installed this waste weir meter with level recorder. Bucket on wheel drops sample into the kettle through funnel and spout

A float is used to indicate the level of the liquid that flows over the standard 60 deg V-notch weir. It actuates a magnifying (2 to 1) link arrangement in a converted 24-hr temperature recorder. The center of the chart is the lowest operating level, while the outside indicates the maximum liquid level.

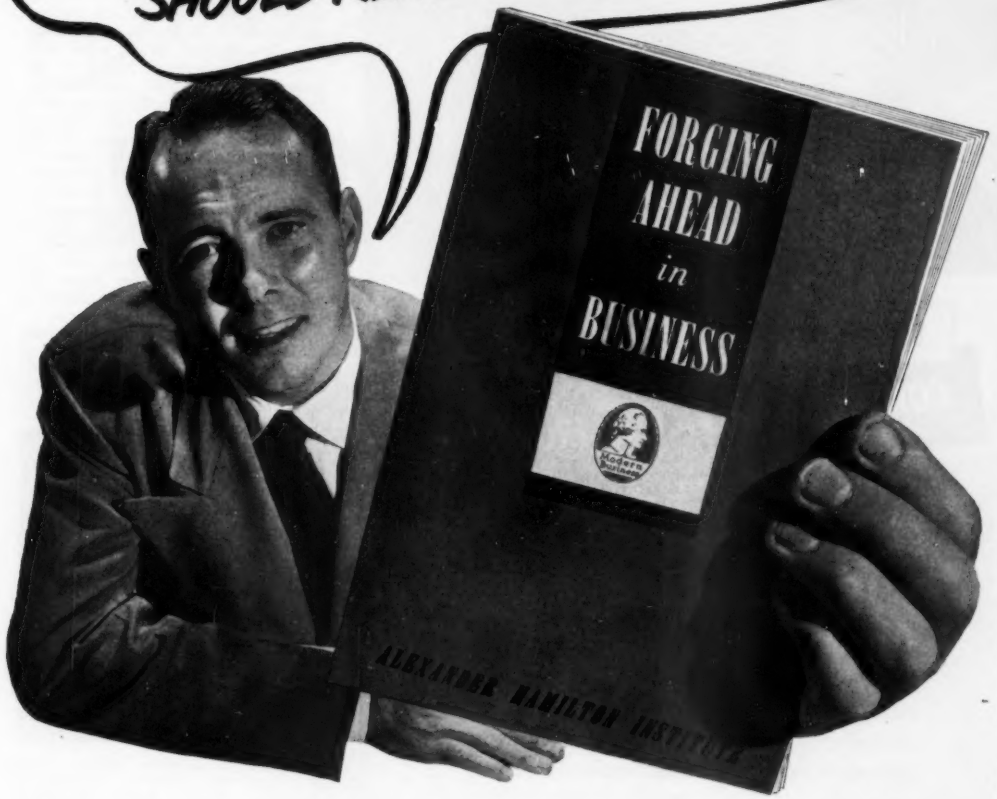
By calibrating the weir and using the theoretical V-notch weir equation, a chart was made that converted the area under the curve on the chart (24 hrs) to an average height of liquid passing over the weir. Another chart converted the average daily height of liquid over the weir to the daily average flow.

The sampling wheel has one paddle in the form of a small conical bucket that discharges a few drops of waste soda solution into the sample kettle. A sampling ratio of 7,000 to 1 is obtained.

Once per shift a small composite sample is made for analysis from the gallon sample. Standard rules take care of irregularities in operations, and routine calculations supply the answers.

The unit, which has been in operation for over 4 yrs with practically no maintenance, requires no specialized training for its operation. *From an article by G. A. Revell in Taylor Technology, published by Taylor Instrument Cos., Rochester, N. Y.*

EVERY MAN EARNING LESS THAN $10,000 A YEAR SHOULD READ THIS FREE BOOKLET



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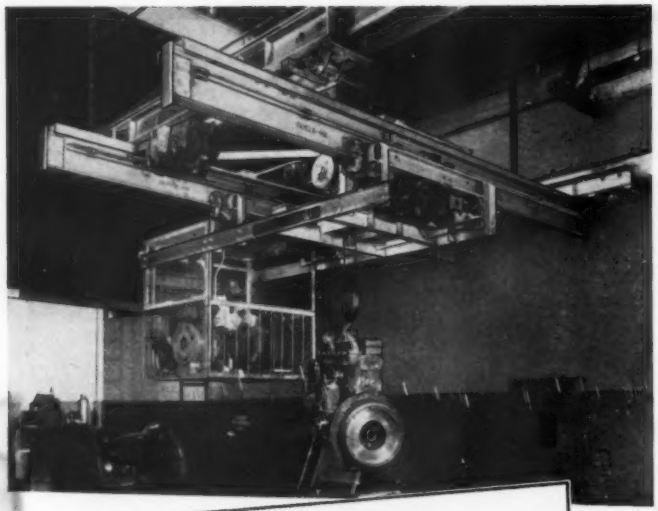

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If your handling operations must be "on the go—all the time—and fast" then investigate this American MonoRail Crane. With constant service at high speed, it offers the advantages of rugged construction, low-cost operation and quick installation.

The big reason is articulated trolleys. Each trolley wheel carries its share of the load in perfect alignment with the craneway tracks. All possible friction is eliminated. The result is perfectly articulated trolley travel. Articulated trolleys permit operating speeds of 500 feet per minute under constant service.

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THE AMERICAN MONORAIL COMPANY

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PLANT ENGINEERS' DIGEST

(Digest begins on page 24)

sound waves travel through the metal and are reflected back to the source by the opposite surface.

Sound travels through metals at known rates which are not appreciably influenced by ordinary variations in temperature and alloy content. Thickness of the metal can be determined from the fundamental frequency at which the plate metal vibrates in resonance. The fundamental resonance frequency is directly proportional to the speed of sound in the metal and inversely proportional to twice the thickness.

The instrument used by the company has a range of 0.65 to 2.0 megacycles and will measure thicknesses from approximately 0.060 in. to 12 in. Results have shown an accuracy within 3 per cent of actual thickness.

The company's practice is to use the ultrasonic vibration type of instrument on pulp digesters where the wasting away of metal is usually of a more uniform character. The

Inspector is checking digester plate thickness with ultrasonic vibration instrument. Circled figure indicates the thickness that has been measured

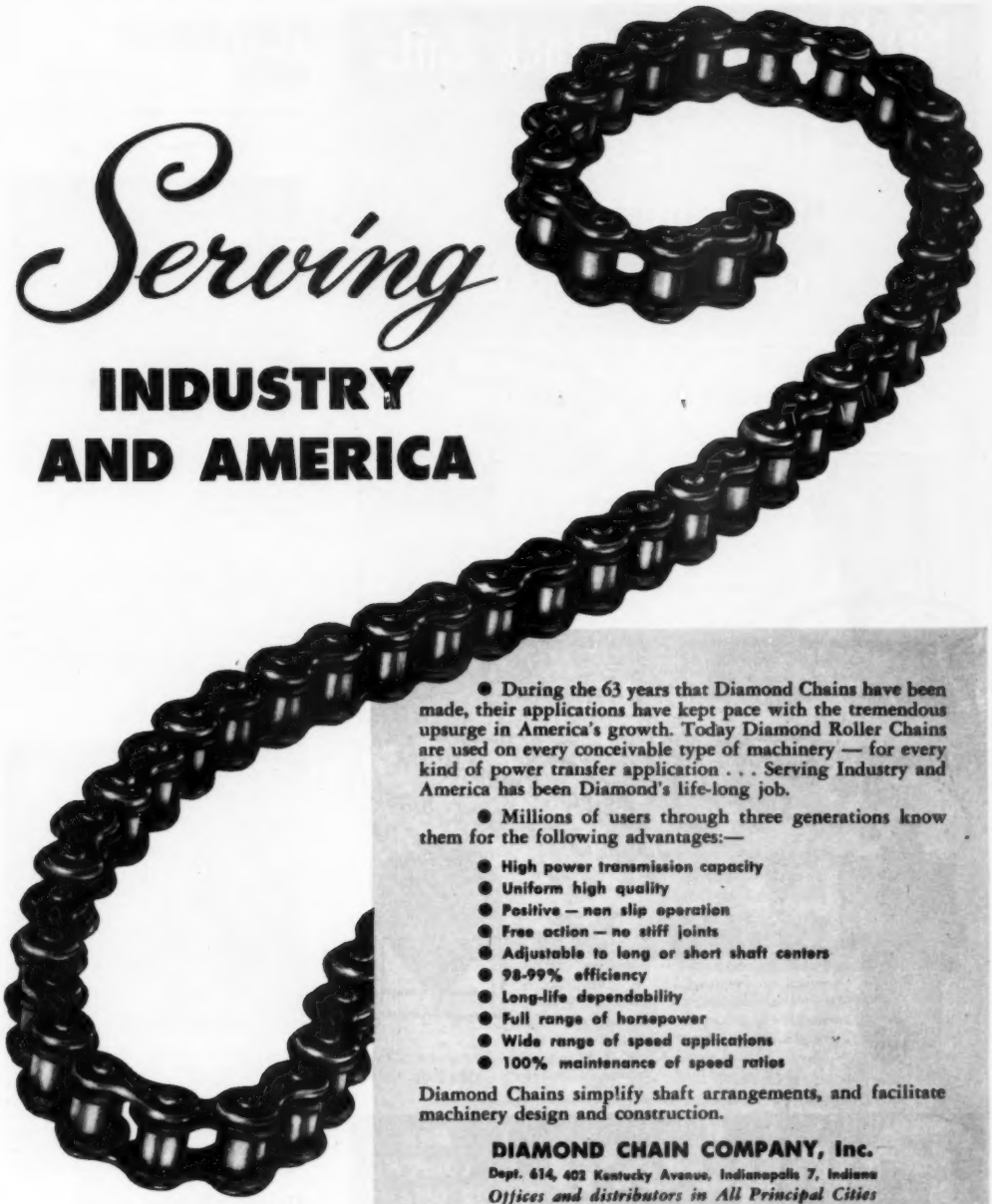
electronic type is used on boilers, hot water tanks, air tanks and chemical tanks because of pitting and uneven surfaces. *From the Condenser, published by the Mutual Boiler and Machinery Insurance Co., Boston, Mass.*

Rugs Go by Cable

AN AERIAL rug conveyor transports rugs between buildings at the plant of the Mohawk Carpet Mills, Inc. in Amsterdam, N.Y. The boxcar-like object, which can handle 1700 lbs of rugs and carpets was devised by the plant's master mechanic.

A single cable is secured to one

Serving INDUSTRY AND AMERICA



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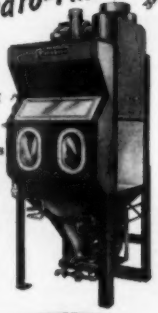
Blast Clean with this Portable Unit!

Ideal for maintenance and many other jobs, including removal of rust, dirt, scale, etc. Economically cleans large objects like tanks, bridges, structural work before painting. Six sizes, stationary or portable, from . . . . **$170.00** and up.

Speed Polishing with Hydro-Finish!

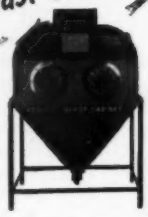


Removes scale and directional grinding lines . . . prepares surfaces for plating and holds tolerances to .0001"! Liquid blast reduces costly hand cleaning and finishing of molds, dies, tools, etc. Models from **$1410.00** and up.

Stop Dust at the Source!

Pangborn industrial type Unit Dust Collectors trap dust at source. Machine wear is minimized, housekeeping and maintenance costs reduced. Solves many grinding and polishing nuisances and material losses. Models from **$286.00** and up.

Clean Small Work in this Blast Cabinet!



Ideal for producing smooth, clean surfaces on pieces up to 60" x 36" in size. Cleans metal parts, removes rust, scale, dirt, grime, paint, etc., in a few seconds. Saves money all year 'round. Models from . . **$319.00** and up.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

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PLANT ENGINEERS' DIGEST

(Digest begins on page 24)

Man atop unit has been logging flying carpet time for many years. His job: to grease and inspect suspension cable

end of the car and passes around a sheave in one of the buildings. Then it runs around a drive sheave in another building and back to the other end of the car. *From the Otis Bulletin, published by Otis Elevator Co., New York, N.Y.*

Dock Plates Stay Put

To provide for safety in car unloading, Wilmington, Del. plant of Bemis Bros. Bag Co. uses this setup. Recessed edge of dock keeps plate flush with dock level. Holes in plate fit over pins that have been anchored to a supporting steel strip. (From Bemistry, published by Bemis Bros. Bag Co., St. Louis, Mo.)

Unloading Problem Solved

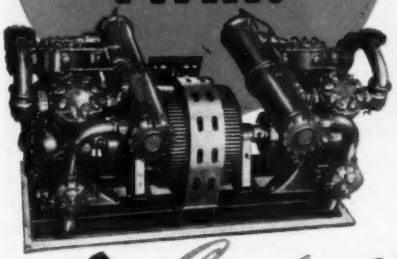
UNLOADING 20 ft lengths of tube steel stock from boxcars with 6 ft door openings is like getting 10 lb of flour into an 8 lb sack; both problems require a tricky solution.

This unloading puzzler is being solved by the National Acme Co. of Cleveland with a crane truck. A load of steel is snaked through the boxcar door while a workman guides the bundle into its proper

Get TROUBLE-FREE AIR POWER at ROCK-BOTTOM COST!

JOY Series 100 compressors are available in two and four cylinder models and in single and twin units. Capacities from 378 to 3656 c.f.m.

UP TO 3656 C. F. M. in a TWIN!



with a JOY PACKAGE TYPE

HEAVY DUTY WN-114 COMPRESSOR

Install it, start it,—then forget it! That's what you can do with a JOY compressed-air power unit, because it's built to give constant, dependable service 24 hours a day, year in and year out. JOY Series 100 Air Compressors are two-stage, double-acting, heavy duty, continuous service compressors—much smaller than old style compressors of the same capacity, yet with operating economies exceeding those of the older, bulkier units. JOY *pioneered* the compact, modern, "package-type" compressor.

All wearing parts are replaceable on the Series 100—the finest air compressors you can put on the job. ● *Let us give you full details on the size that fits your air-power requirements.*

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WAD-3513

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Noisy machinery, like this power shear, is of serious concern to responsible management. Noise accelerates and increases fatigue, slows reflexes, increases nervous tension—all accident breeders. In extreme cases deafness can result.

Isolation of noisy machinery—as the shear has been isolated by ISC "Soundmetal" panels—is the first and most important step in the completely integrated anti-noise program being studied by management groups today.

INDUSTRIAL SOUND CONTROL, INC., was the originator of noise-suppressing methods for industry. Our engineering, design, and installation "know how" is yours for the asking.

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PLANT ENGINEERS' DIGEST

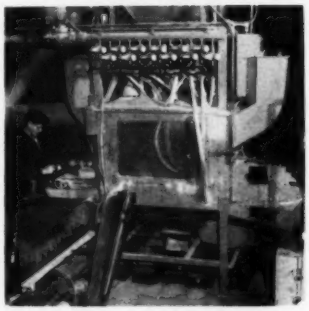
(Digest begins on page 24)

Guided by workman, bundle of tubes is easily removed from car by small crane

spot on the shipping dock after hooking it inside the car.

Before this system of using a crane started, 4 men did the work manually. Tubes were hauled out of the cars one at a time. Now, 2 men (one in the car, the other operating the crane) empty a car in less time than it used to take 4 laborers. The crane cuts man-hr requirements by 60 per cent and helps the company cut down on smashed-finger accidents. *From a release of the Baker-Raulang Co., Cleveland, Ohio.*

Deburring with Walnut Shells



Walnut shells are used for metal deburring by Rochester Products Division of General Motors. Rough castings fed by the operator at left are bombarded by ground-up shells blown by compressed air. Process is quick and quiet. (From G M Folks, published by General Motors Corporation, Detroit, Mich.)

Bar Keeps Wheel from Spinning

ALTHOUGH GEAR cutters at the Diamond Chain plant in Indianapolis, Indiana, operate automatically, they are equipped with handwheels that

(Continued on page 38)

Full Electric Fork Truck Operation in 6 FOOT AISLES*

The ALL NEW LEWIS-SHEPARD SPACEMASTER MODEL "M"

at ½ the usual Electric Fork Truck cost

Straddle Type
3000-4000 lbs.
capacity

*With 42" long, 48" wide loads

40% More Storage Space . . . The "M" uses only 6 feet of this 10 foot aisle, leaving room for an extra row of stacked loads.

You get more travel speed with more stability, plus higher lifts at faster speeds than with any similar truck . . . All controls are in the palm of one hand for quicker, safer operation.

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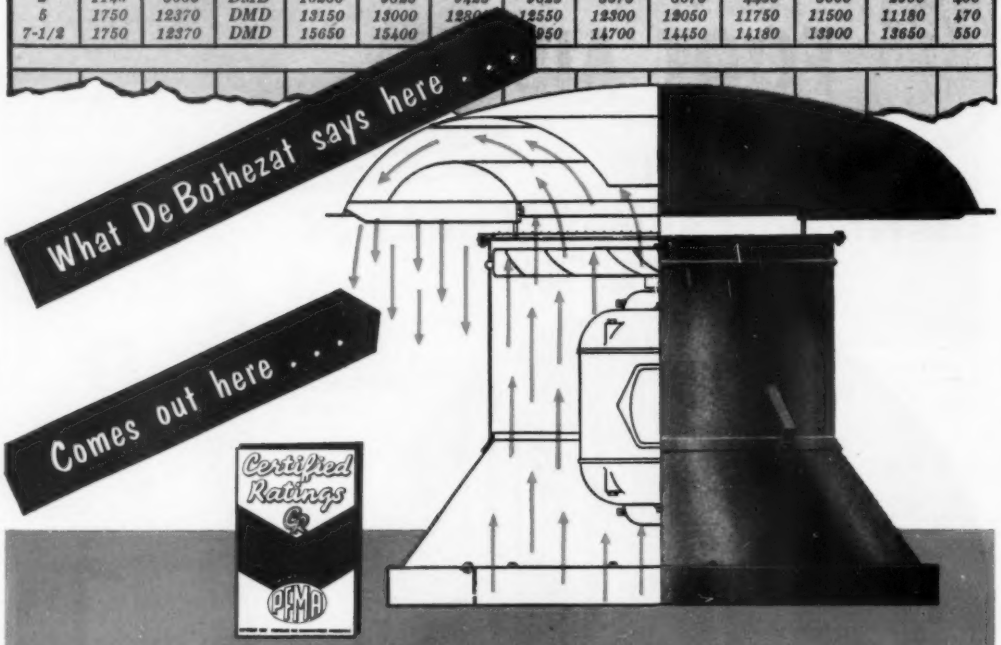
2	1140	3080	DMD	10200	9825	9425	9025	8575	8075	4450	3600	2900	400
5	1750	12370	DMD	13150	13000	12800	12550	12300	12050	11750	11500	11180	470
7-1/2	1750	12370	DMD	15650	15400		950	14700	14450	14180	13900	13650	550



POWER-FLOW ROOF VENTILATOR RATINGS ARE OUTPUT OF COMPLETE UNIT, WITH HEAD . . . *NOT* OUTPUT OF FAN ALONE

When you specify DeBothezat Power-Flow Roof Ventilators, you can be sure that they will perform as rated. DeBothezat capacity ratings are the output of completely assembled units, INCLUDING THE HEAD, obtained from wind tunnel tests conducted in accordance with the Standard Test Code, Plate VI. They conform with U. S. Department of Commerce Commercial Standard 178-51, which embodies the test codes of ASHVE, NAFM and PFMA.

Power-Flow Roof Ventilators are available with fan wheels from 12" through 48" in diameter, with capacities up through 40,900 CFM. Next time you need roof ventilators, specify DeBothezat and get all the air you pay for.

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Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

BULLETINS just released and of immediate plant interest

PUMPS, COMPRESSORS

101 Condensed Pump Data—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, features and references to specific literature providing further information. Goulds Pumps, Inc.

102 Heater-Pumping Booster for Heavy Liquids—Form AD-104 features the Deuce, company's combination tank car heater and pumping booster designed to raise penetration asphalts, tars and other materials to required high application temperatures and deliver them to transfer truck, tank, etc. The unit heats and transfers material through the direct oil fired pumping booster. Specifications, construction details given for mobile mounted and skid mounted types. Cleaver-Brooks Co.

103 Materials Dispensing Equipment—Catalog 40, 12 pp, presents a line of air-motor operated pumps and accessories for automatic dispensing and application of heavy to light materials, such as sealers, adhesives, waterproofing, insulating and caulking compounds. Shows 11 standard models for spray gun, pole gun and flow-gun applications, also units for custom-designed systems. Lincoln Engineering Co.

104 For Pumping Liquid Metals—Bulletin GEC-876, 2 pp, describes an a-c electromagnetic pump for liquid metals and other low-resistance conducting fluids. Illustrates the unit, discusses its features and operation, includes specifications. General Electric Co.

105 Air Compressors—Two-stage radial air compressors producing 80 to 125 lb pressure are described in Bulletin H-630-B1, 12 pp. Gives dimensions and weights of bare compressors, base-mounted multi-V belt driven compressors, and flexible-coupled compressors, also close-coupled compressors. Capacities, sizes, specifications included. Pictured and explained are articulated connecting rod, fan-cooling of isolated cylinders. Worthington Corp.

106 Portable Compressors—New literature on company's Gyro-Flo portable compressors is announced. Illustrated in color, tells how these rotary compressors work, explains design features, oil injection cooling and oil separation, and capacity control. Form 2314 describes a 105 cfm compressor and Form 2316, a 315 cfm unit. State choice or both. Ingersoll-Rand Co.

PACKINGS, SEALS, CUPS

107 Braided Rod Packing—This 8-pp bulletin outlines advantages of company's lattice-braid rod packing. Contains sectional drawings, showing their unique structure, illustrations of types available, tables of service recommendations, specifications and reports from users. The Garlock Packing Co.

108 For Dependable Shaft Sealing—This bulletin explains by text keyed to a cutaway drawing how company's unit seal serves to eliminate shaft sealing problems. Four typical installations are illustrated, dimensions included. Gits Bros. Mfg. Co.

109 Molded Piston Cups—Complete information on molded cups for pump pistons, hydraulic service and pneumatic equipment is provided in 6-pp Bulletin AD-145. Illustrates various types of cups, gives service data and a full list of sizes and part numbers. Typical applications are also shown. Garlock Packing Co.

COOLING, HEATING

110 Cooling Towers—Bulletin CT-52-4 is a generously illustrated 36-pp booklet on mechanical induced-draft counter-flow cooling towers. Stresses advantages of this type of tower, describes and pictures design and construction, choice of casings available. Distribution system and major equipment are described in detail and effects of recirculation and surroundings on cooling tower performance are explained. Foster Wheeler Corp.

111 Heat Exchanger for Process Industries—Bulletin HF-101, 8 pp, introduces the Holo-Flight Processor, a new type of heat exchanger for cooking, cooling, heating, and drying applications. Explains how it affords control of the flow of material as to duration of treatment, and control of the quantity and temperature of heat exchange agent. Discusses dispersion convection principle utilized and stresses the versatility, compactness and other advantages. Western Precipitation Corp.

112 Oil Heat Exchanger—This folder describes and pictures an oil heat exchanger and oil clarifier designed as a combined integral unit and intended to prevent many of the undesirable mechanical conditions encountered in the operation of diesel powered equipment. Illustrates equipment, explains how it minimizes engine wear; describes separator element, oil flow, cooling. J-B Engineering, Inc., Ltd.

113 Spray Nozzles—Plant engineers interested in spray nozzles for cooling ponds, cooling towers and similar heat transfer applications will find a wealth of information in 40-pp Bulletin 5200. Describes industrial spray nozzles for a broad range of commercial and industrial processes. Data given includes dimensions, capacities, spray angles. All nozzles are illustrated, cutaway drawings show construction and operating details; blueprint drawings show installation methods. Binks Mfg. Co.

114 Water Tube Convertors—Bulletin 35-77, 32 pp, contains complete tabular information for selecting proper size convertor for a plant's operating conditions. Dimensions, weights, prices and performance figures are presented in tables. A nomograph relating to steam consumption, steam connection sizes and water connection sizes in choosing a convertor, and a tabular presentation of flow of water through schedule 40 steel pipe included. American District Steam Co., Inc.

115 Unit Heaters—Sixteen-pp Catalog 1209, presenting a line of propeller fan unit heaters, includes description, photos, applications and specifications of both horizontal and vertical units. Diagrams show ideal arrangements for getting the most efficiency from unit heaters for areas of various shapes; tables and charts give capacities. Airtherm Mfg. Co.

116 Holding Heat—A booklet entitled "Heat Enclosure Methods" is available to engineers with problems of containing heat within structures. Beginning with a historical section, the text leads into modern applications of refractories in boilers, oil stills, open hearths. M. H. Detrick Co.

BOILERS, GENERATORS

117 Two-Drum Boilers—This new 16-pp bulletin describes two-drum boilers of the integral furnace type, giving information and dimensional data on company's 3-VC and 4-VC designs, both available for oil, gas or stoker firing. Typical installations for various types of firing are pictured. Erie City Iron Works.

118 Water-Tube Generators—Dimensions and design details of a water-tube steam generator are presented in 6-pp Bulletin B-2375. This is complete shop-assembled unit adapted for firing with light or heavy oils, gas, or oil and gas in combination. The Titusville Iron Works Co.

119 Oil or Gas Fired Automatic Boilers—Boiler, burner, controls and safety features of 10 to 500 hp oil or gas fired automatic boilers are described in this 4-pp bulletin. Firing rates, dimensions and capacities are given for all models. Boiler Engineering & Supply Co., Inc.

MECHANICAL POWER TRANSMISSION

121 Variable Speed Drives—Company's Allspeed motor drives of ½ to 7½ hp are described in 16-pp Bulletin AS-1600-B6. Presents both horisontal and upright drives of closed or skeleton types. Pictures ease of belt change, discusses service, electric motors, torque, bases, adverse operating conditions, shaft variations and mounting. Provides selection data, tips on operation and maintenance; explains features and advantages. Worthington Corp.

122 Centrifugal Refrigeration Drives—E-M Synchroniser No. 36, 24 pp, deals with the application of a-c motors to centrifugal refrigeration compressors. Includes article covering refrigerant characteristics, compressor capacity control, motor characteristics and control. Also includes articles on "The Line Diagram," and "How to Select Control for Wound Rotor Motors." Electric Machinery Mfg. Co.

123 Roller Chain Data Book—Book 2457, 148-pp, is one of the most comprehensive on roller chain and its application. Detailed engineering information covers selection, installation, lubrication and maintenance of roller chain for drives and conveyors, and sprocket wheels. Shows photos and line drawings of types and sizes of chain and wheels, also 59 typical conveyor chain attachments. Design notes and selection data serve as practical text on roller chain for both power transmission and conveying

September, 1952

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service; and formulas, charts, diagrams and typical problems simplify selection. There's also a section on pre-selected drives available from stock. Link-Belt Co.

124 Bearings and Bars—Brand new Catalog 33, 74 pp, presents up-to-date information on a line of standard stock bearings, precision bronze bars, electric motor bearings and graphited oilless bearings. Fully illustrated, indexed, provides sizes, ordering information, design and engineering details; also discussion of operating principles of the sleeve bearing, grooved bearings, installation of bearings, special types. The Bunting Brass & Bronze Co.

126 Flexible Coupling—Bulletin 2300 gives complete data on company's Crown coupling, including construction details, ratings, speeds, applications and selection tips. DeLaval Steam Turbine Co.

SAFETY, SANITATION

127 Packaged Fire Safety—Ten-pp bulletin introduces an entirely new packaged automatic carbon dioxide system, available for customer installation. What, why, and how of CO_2 extinguishing is explained, and method of operation of automatic system is diagrammatically presented. Accessories are listed and described and a typical installation of the system is shown. Walter Kidde & Co., Inc.

128 Washroom Economy—Catalog 3304 pictures and describes the advantages of group-washing fixtures for industrial plants, institutions. Saving in water consumption, floor space, installation and maintenance costs, as well as improved sanitation, can be achieved by modern washroom equipment, and this catalog offers valuable data on comparative costs and advantages of group-washing washing fixtures. Bradley Washfountain Co.

ELECTRICAL

129 Centralized Circuits—Bulletin B-388, 8 pp, contains complete information and specifications on Fushmatic Electri-Centers. Use of the centers to replace fuse boxes is cited for small plants. Information on component circuit breaker is also included. BullDog Electric Products Co.

130 Potheads and Terminals—New Catalog C70-13, about 100 pp, comprises Section 13 of manufacturer's general catalog. Includes complete design data as well as information and instructions for ordering and installing all types up to 46 kv. Features both outdoor and indoor types and designs for transformers and switchgear. Anaconda Wire & Cable Co.

131 Telephone Battery Maintenance—Six-pp Form GB-1465 provides instructions covering battery operation. Describes unpacking, installing and charge freshening methods. Technical data for various cell types and sizes are given. Hydrometer reading and correcting procedures are outlined. Gould-National Batteries, Inc.

132 Float Battery Instruction Sheet—Designed to help plant engineers responsible for alarm systems and other systems using storage batteries on float, this sheet shows how and why Plante and Ploté batteries are designed to give longer life in floating service. Describes the self-discharge of these batteries that float on lines from d-c generators or rectifiers to supply peak power and take full load during failures. Gould-National Batteries, Inc.

133 Selenium Rectifiers—Recently published catalog sheets provide up-to-date information on selenium rectifiers for anodyzing, electroplating applications, for power conversion for applications involving corrosive atmospheres as well as automatic chargers for industrial truck batteries. Fully illustrated, these sheets explain design features, operating principle, dimensions. Wesley Block and Co.

INSTRUMENTS, CONTROLS

134 For Positioning Control—Bulletin 157, 12 pp, presents company's Hydro-Torque designed for accuracy and power in hydraulic positioning and indicating applications. Explains the operation and adaptability of the system, lists ten mechanical advantages. Transmitter and receiver are described, specifications given. Includes thrust and torque capacities, installation pointers. Parris HydroTorque Corp.

135 Cam-Operated Controllers—Electric contact, electric proportional and pneumatic control forms of Electronik cam operated program controllers are described in 7-pp Bulletin 1502. The instrument is usable wherever a controlled schedule of time-temperature is needed. Industrial Div., Minneapolis-Honeywell Regulator Co.

136 Static Control in Textile Industry—This is a 5-pp illustrated article covering control of static problems in textile processing. Discusses cause of static and various control methods. Electronic static elimination by controlled diffuse discharge is treated in detail, showing application in drawing operations, calendars, looms, printing, etc. The John Hewson Co.

The post card below needs no postage. Use it to order bulletins by listing item numbers of all those wanted. Two other cards are provided for you on page 171.

137 Pilots and Controllers—Catalog Section 110, recently revised, shows complete lines of time cycle controllers, pressure controllers, manual remote controllers, vacuum pilots and safety shut-off pilots, and is generously illustrated. The new pressure controller, Type 1400-LP, featured, was designed to obtain smooth control by using bellows for low pressures and to provide a control with a rate of change that can be measured in inches of water. Black, Sivalls & Bryson, Inc.

138 Central Control Panel Systems—Eight-pp Bulletin P 5265 outlines a technique for use in designing economical automatic electric control installations for heating and air conditioning systems. Illustrated by photos and wiring diagrams, stresses the simplified installation possible, lower over-all costs, increased system flexibility and other advantages. Barber-Colman Co.

139 Power Generation Instruments—Catalog 90-2, "Supervisory Instruments for Power Generation," 41 pp, covers steam generation instrumentation, turbine and generator instrumentation, electrical distribution instrumentation and diesel engine instrumentation. The measurement of temperature, pressure, flow, power generation and other variables encountered are discussed. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

140 Flow Rate Control—The principle of operation used by company's direct acting regulators is illustrated in Bulletin 8XI which also shows how the simplicity of this principle contributes to accuracy and flexibility in service. W. A. Kates Co.

141 Data on Pressure Gages—Newly published information on pressure gages is presented in these three specification sheets, each 4 pp. No. 708 describes indicating and recording pressure gages, giving construction and engineering details. No. 709 gives similar data on indicating-recording gages with Electr-O-Vane control. No. 710 covers indicating-recording gages with pneumatic control. List sheets wanted. Brown Instruments Div., Minneapolis Honeywell Regulator Co.

142 Electrical Equipment for Cranes—A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin CS-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated with photos, charts and drawings. Includes full data on motors, brakes, controllers. Overhead Crane Div. Harnischfeger Corp.

GAS EQUIPMENT

143 Exothermic Gas Generator—Eight-pp Bulletin X101 describes various gas generators for creation of gaseous atmospheres in industry. Applications, cost of operation, types of gases generated, ratings, dimensions and output ranges of the company's generators are detailed in tables and charts. Gas Atmospheres, Inc.

144 Gas Scrubbing Equipment—Bulletin Supplement 4RA outlines various types of gas scrubbing equipment manufactured by this company. Covers applications, construction and operating features, component parts, gas scrubbing systems and a new packaged scrubber unit. Schutte and Koerting Co.

PROTECTIVE COATINGS

145 Anti-Rust for Over Rust—Data File 2158A, 4 pp, describes Overust anti-rust paints, giving their chemical properties. Explains how these paints contain chromates which make them effective against rust even when applied directly over rusty surfaces. These paints come in five colors and clear and are for use over any kind of metal surface. Bulletin gives coverage, data on use. The Chem Industrial Co.

146 Tough Finish—Porcelain enamel for industrial use is described in this 16-pp booklet. Its properties are listed, and ap-

(Continued on page 171)

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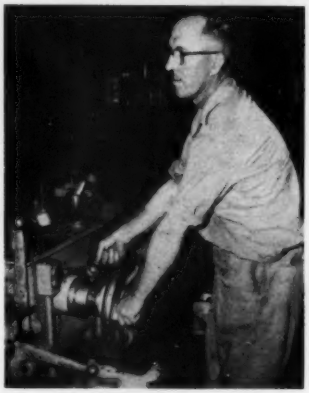
PLANT ENGINEERS' DIGEST

(Digest begins on page 24)

are sometimes used for adjustments. On the basis of a recent occurrence at the plant this feature of a machine can be dangerous.

Not very long ago, a man was severely bruised when a handwheel engaged while a machine was on automatic. This caused the wheel to spin rapidly. As a result the hand grip on the wheel struck the operator knocking him several feet away.

One of the machine repairmen at the plant decided to do something about this condition. He proceeded to design and install a simple but



Employee lifts hold-out bar which keeps the handwheel from becoming engaged

effective device on the gear cutters. This is a pivoted "hold-out" bar that prevents the wheel from becoming engaged. In order to make manual adjustments, the operator must lift this locking member before he can proceed. *From Chain Gang, published by Diamond Chain Co., Inc., Indianapolis, Indiana.*

Induction Heat Reduces Cost

THE COST of hardening basket shafts for use in washing machines has been reduced by 48 per cent at the Easy Washing Machine Co.'s plant in Syracuse, N.Y. This has been made possible through the use of 15-kw electronic induction heaters.

According to the general foreman of the company's heat treating department the entire cost of the hardening process has been lowered from 13 to 6¾ cents per shaft. This cost reduction includes labor and power costs, repairs, depreciation and overhead.

Before adopting the induction

JENKINS PRACTICAL PIPING LAYOUTS 62

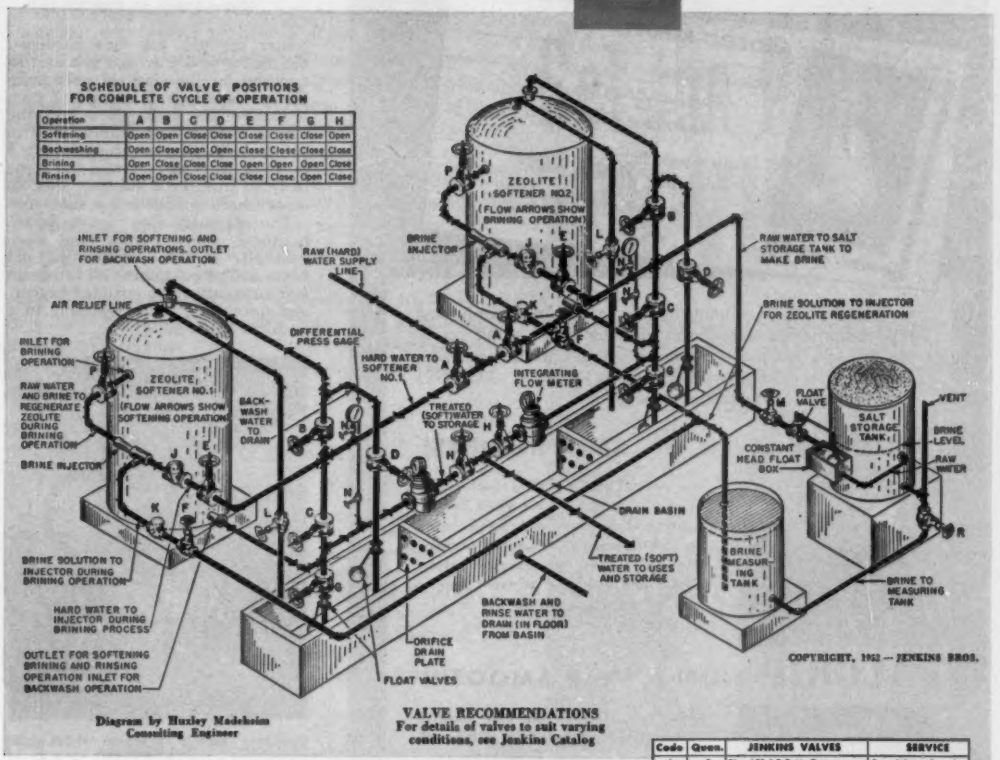

SCHEDULE OF VALVE POSITIONS FOR COMPLETE CYCLE OF OPERATION
Operation | A | B | C | D | E | F | G | H
Softening | Open | Open | Close | Close | Close | Close | Close | Open
Backwashing | Open | Close | Open | Open | Close | Close | Close | Close
Brining | Open | Close | Close | Close | Open | Open | Open | Close
Rinsing | Open | Open | Close | Close | Close | Close | Open | Close
ZEOLITE SOFTENER NO.2 (FLOW ARROWS SHOW BRINING OPERATION)
BRINE INJECTOR
INLET FOR SOFTENING AND RINSING OPERATIONS. OUTLET FOR BACKWASH OPERATION
RAW (HARD) WATER SUPPLY LINE
RAW WATER TO SALT STORAGE TANK TO MAKE BRINE
BRINE SOLUTION TO INJECTOR FOR ZEOLITE REGENERATION
AIR RELIEF LINE
INLET FOR BRINING OPERATION
DIFFERENTIAL PRESS GAGE
HARD WATER TO SOFTENER NO.1
INTEGRATING FLOW METER
ZEOLITE SOFTENER NO.1 (FLOW ARROWS SHOW SOFTENING OPERATION)
RAW WATER AND BRINE TO REGENERATE ZEOLITE DURING BRINING OPERATION
BACK-WASH WATER TO DRAIN
TREATED (SOFT) WATER TO STORAGE
FLOAT VALVE
SALT STORAGE TANK
VENT
BRINE LEVEL
RAW WATER
CONSTANT HEAD FLOAT BOX
BRINE INJECTOR
DRAIN BASIN
BRINE MEASURING TANK
TREATED (SOFT) WATER TO USES AND STORAGE
BRINE SOLUTION TO INJECTOR DURING BRINING OPERATION
BRINE TO MEASURING TANK
HARD WATER TO INJECTOR DURING BRINING PROCESS
BACKWASH AND RINSE WATER TO DRAIN (IN FLOOR) FROM BASIN
ORIFICE DRAIN PLATE
OUTLET FOR SOFTENING BRINING AND RINSING OPERATION INLET FOR BACKWASH OPERATION
FLOAT VALVES
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Diagram by Huxley Madeheim Consulting Engineer

VALVE RECOMMENDATIONS
For details of valves to suit varying conditions, see Jenkins Catalog

Code	Quan.	JENKINS VALVES	SERVICE
A	2	Fig. 651 I.B.B.M. Gate or Fig. 100 All Iron Gate	Raw Water Supply to Softener
B	2	Fig. 651 I.B.B.M. Gate or Fig. 100 All Iron Gate	Control of Cycle Operations
C	2	Fig. 651 I.B.B.M. Gate or Fig. 100 All Iron Gate	Control of Cycle Operations
D	2	Fig. 651 I.B.B.M. Gate or Fig. 100 All Iron Gate	Backwash Drain Line
E	2	Fig. 100 All Iron Gate	Injector Water Shutoff
F	2	Fig. 40-A All Iron Gate	Brine Control to Injector
G	2	Fig. 651 I.B.B.M. Gate	Brine and Rinsing Operation Drain
H	2	Fig. 651 I.B.B.M. Gate	Softened Water Shutoff
J	2	Fig. 624 I.B. Swing Check or Fig. 83 All Iron Swing Gate	Prevent Backflow
K	2	Fig. 623 I.B. Swing Check or Fig. 82 All Iron Swing Gate	Prevent Backflow
L	2	Fig. 106-A Bronze Globe	Air Release
M	1	Fig. 106-A Bronze Globe	Water Supply for Brine
N	4	Fig. 743-G Bronze Needle	Pressure Gage Control
P	2	Fig. 100 All Iron Gate	Brine Connection Shutoff at Softener
R	1	Fig. 40-A All Iron Gate	Brine to Measuring Tank

How to plan a ZEOLITE (BASE EXCHANGE) WATER SOFTENING SYSTEM

Diagram shows piping connections for a zeolite water softening system (removal of hard water impurities). Twin softening units permit one to operate while the other is being regenerated, (replacing used sodium in the zeolite).

The complete cycle consists of softening, backwashing, brining, and rinsing. After a certain amount of raw water has been softened, the sodium in the zeolite is used up. The process is then stopped by operating the valves as indicated in the schedule, and the other softening unit is put into operation.

The zeolite is regenerated, after the backwash operation (first step in regeneration of softener), by replacing accumulated calcium and magnesium with the sodium by running through a brine solution. The zeolite is then rinsed after correct amount of brine solution has been admitted.

The rinsing operation also removes any remaining brine, making the softener ready for re-use when needed. Depending upon the chemical composition of the water, either iron-body bronze-mounted or all-iron valves are recommended on all lines conducting the water before it is completely treated.

Consultation with piping engineers is recommended when planning any major piping installations.

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from Jenkins complete line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

Complete description and enlarged diagram of this layout free on request. Includes additional detailed information. Simply ask for Piping Layout No. 62.

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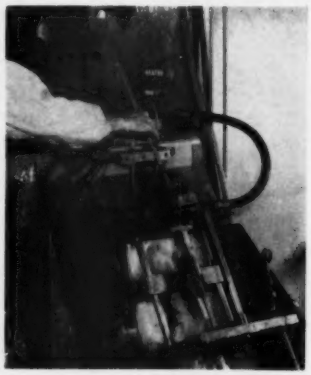
PLANT ENGINEERS' DIGEST

(Digest begins on page 24)

heater method, the firm hardened the shafts by a chemical process. In addition to the cost of chemicals, this process took 3 shifts of 2 men to harden 1600 shafts. Now, with the use of heaters, one man is able to accomplish the same thing in one 8 hr shift. This has allowed the company to transfer 5 valuable men to other, more productive posts.

The company also reports better hardness characteristics than were generally achieved under the old process. The equipment allows exact and automatically controlled heating and quenching times resulting in a uniform hardness.



Operator inserts machine shaft into hardening device. This unit consists of an induction coil and a quench ring

Similar savings have been realized by this washing machine company in the manufacture of other parts where this type of heating is used. Induction heaters also supply selective heating for soldering, brazing, and annealing in the firm's highly developed heat treat department. *From a release of General Electric Co., Schenectady, N.Y.*

Centrifugal Pump Performance

IN MANY CASES centrifugal pumps function improperly because air gets into the pump due to: 1. The installation of a suction pipe that is too small in diameter. 2. The end of the suction pipe not being submerged deeply enough. 3. Both of the above undesirable conditions.

If the velocity of the water at the suction pipe entrance is too high, a vortex is created. Air flows through this whirlpool downward to the end of the suction pipe and into the pump casing. Air in the pump casing causes rough and noisy oper-

Industry Leaders Set the Pace with VU

Right down the line, in most every industry, you'll find the leading companies – as well as the smaller companies that may well be tomorrow's leaders – depending on C-E Vertical Unit Boilers for dependable, low-cost steam.

Take Pulp and Paper Mills for example. Few industries use more steam or have a larger stake in the economy and reliability of their steam generating equipment. The list below is just a sample of the nationally-known leaders in the pulp and paper field that have Vertical-Unit Boilers in service at one or more mills.

Only larger companies are listed because here, as in any industry, the buying decisions of big companies are especially significant. Such companies have the breadth of experience, the diversified operating conditions and the organization necessary to explore and evaluate the merits of the equipment they need.

So, where you need boilers – in capacities from 10,000 to 350,000 pounds of steam per hour – take a tip from the leaders. Discover – as they have – the advanced design . . . sound construction . . . proved reliability of C-E Vertical-Unit Boilers.

Leading Pulp and Paper Mills that have Purchased VU Units for One or more Plants

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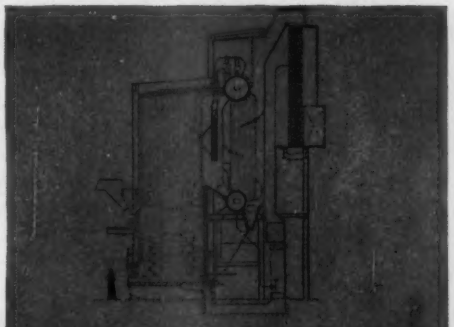
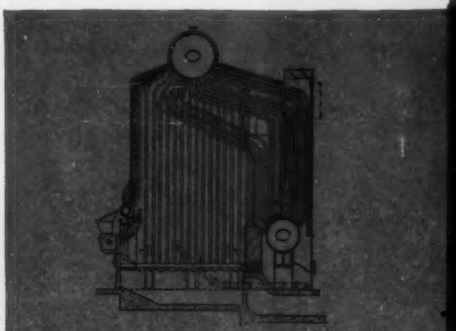
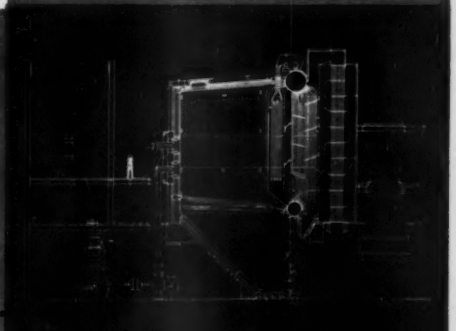
Chesapeake Corporation
Container Corp. of America
Fraser Companies, Ltd.
Robert Gair Company, Inc.
International Paper Company
Kimberly-Clark Corporation
Macon Kraft Corporation
Marathon Paper Mills of Canada, Ltd.
National Container Corporation
St. Regis Paper Company
Scott Paper Company
S. D. Warren Company
Weyerhauser Timber Company



VU-50 Boiler – This unit, one of two duplicates, is installed at a West Coast mill. It is designed to burn hogged wood on a high-set spreader stoker. Capacity – 150,000 lb of steam per hr; operating pressure – 570 psig; steam temperature 675 F.



VU-10 Boiler, one of two in a Midwestern plant. Fired by coal, using a C-E Spreader Stoker. Capacity – 18,000 lb of steam per hr at 200 psig, no superheat. VU-10 capacities range from 10,000 to 60,000 lb of steam per hr.



VU-50 Boiler installed in a Southern mill. This boiler is fired with pulverized coal using C-E Raymond Bowl Mills. The capacity is 150,000 lb of steam per hr. Steam pressure is 865 psi – steam temperature is 825 F.

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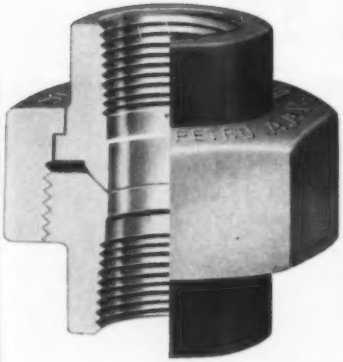

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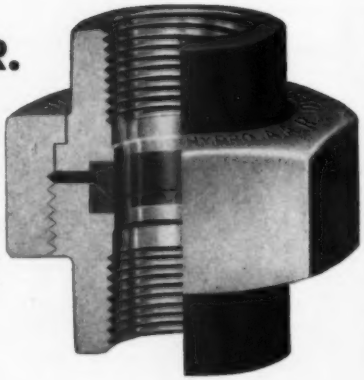

Write Department P for new illustrated catalog or refer to listings in Chemical Engineering Catalog pages 1120-1121, Composite Catalog pages 3140-3141 and Refinery Catalog page 653.

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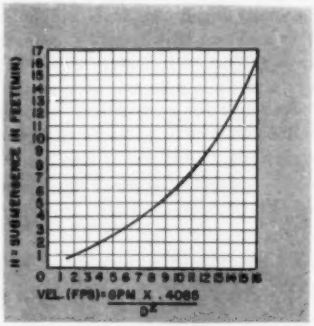
PLANT ENGINEERS' DIGEST

(Digest beings on page 26)

ation and severe vibration. In the course of a short time, this condition may result in a broken shaft.

Sufficient air reaching the pump will completely air bind it. Metal seizure will take place at the impeller hub and the wearing ring from dry operation of the pump.



H.—The minimum depth of fluid entry. Vel.—Entrance velocity at pipe inlet

Unless the pump is very closely motored or adequate protective devices provided, the rotating parts will be wrecked beyond repair.

These difficulties can be avoided by selecting and installing a suction pipe through which the fluid handled enters at a velocity not exceeding that shown on the graph. A slower velocity and lower submergence are good insurance against this type of air trouble. *From Goulds News, published by Goulds Pumps, Inc., Chicago, Illinois.*

Extra-Strength Machinery Guard

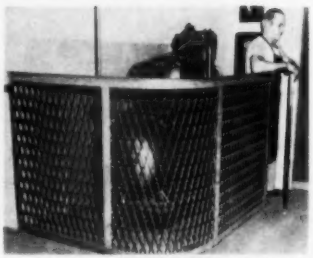


Photo: Irving Subway Grating Co.

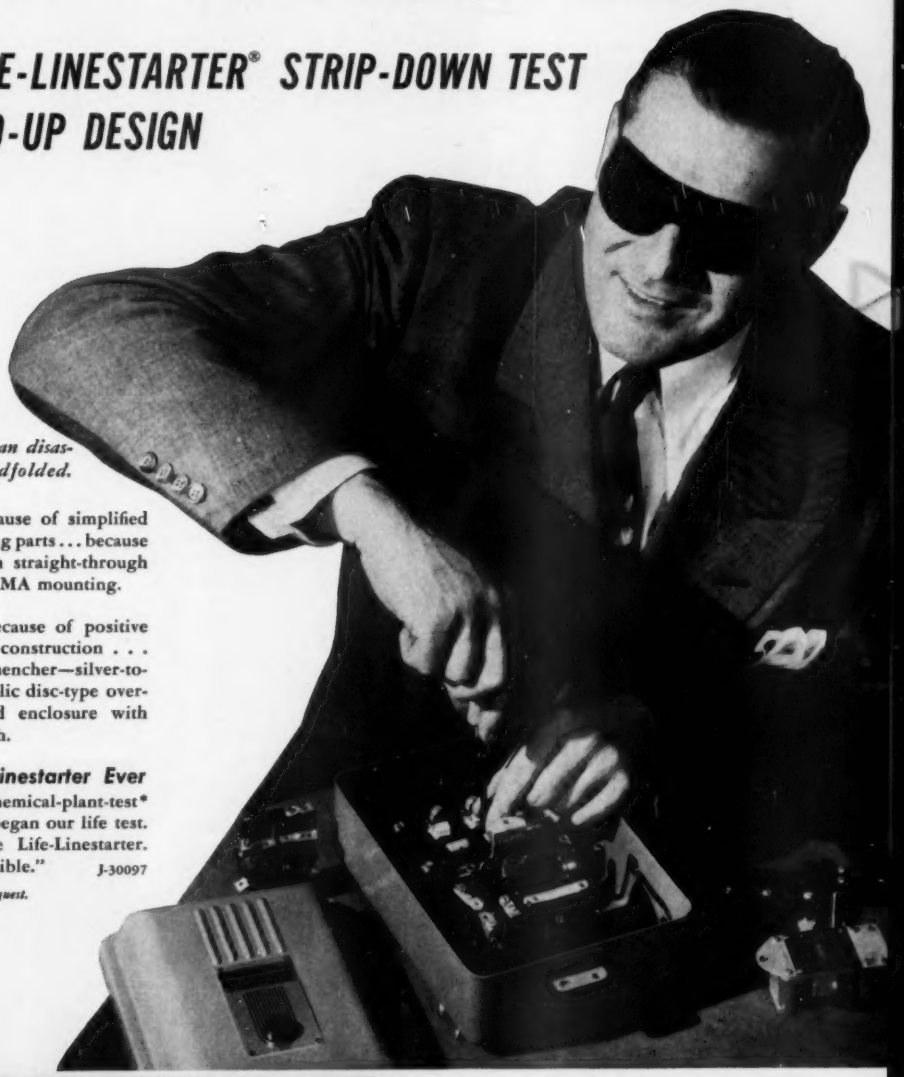
Guard of steel grating can withstand heavier jolts than conventional guard

Spot Welding Tip Dressing

THE MOST ECONOMICAL method of electrode tip dressing in terms of wasted electrode material and equipment down-time is as follows:

DARE TO COMPARE!

See the LIFE-LINESTARTER® STRIP-DOWN TEST for STEPPED-UP DESIGN



So simple you can disassemble it blindfolded.

The Simplest . . . Because of simplified design with fewer moving parts . . . because of easy installation with straight-through wiring and standard NEMA mounting.

The Toughest . . . Because of positive protection and rugged construction . . . patented De-ion® Arc Quencher—silver-to-silver contacts—Bi-metallic disc-type overload relay—Bonderized enclosure with baked, grey enamel finish.

Most Dependable Linestarter Ever Built! . . . A recent chemical-plant-test* showed: "Four starters began our life test. Only one finished, the Life-Linestarter. Contact wear was negligible." J-30097

**Name on Request.*

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Life-Linestarter

SEE THE STRIP-DOWN TEST AT NO OBLIGATION!

It will open your eyes to Life-Linestarter's Stepped-Up Design and Performance. Mail the coupon today!

Westinghouse Electric Corporation
Box 868, Pittsburgh 30, Pa.

Name_____

Title_____

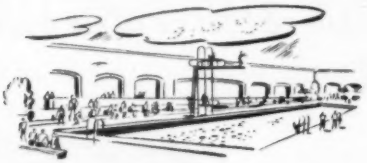
Company_____

Address_____

City_____ State_____

FROM SERVICE STATIONS...

TO SWIMMING POOLS



CHECK CORROSION FROM ACIDS AND ALKALIES LONGER WITH

Fast-drying Parlon (Hercules chlorinated rubber) resists acids, alkalies, fumes, and salts three to four times longer than ordinary coatings. Two typical examples of the high protection Parlon gives to surfaces may be found in service stations and swimming pools.

In garages and gas stations, Parlon rubber-base paint on walls and floors resists the deteriorating action of grease, gasoline and other car servicing products. Where car washing is done, Parlon is ideal for protecting concrete, wood, and metal surfaces from alkaline cleaning chemicals and moisture.

Parlon has proved itself a favorite with swimming pool operators for many years because of its long underwater life. It is particularly durable on concrete pools, since it is unaffected by the free alkali in cement. Ask your paint supplier about easy-to-apply and economical-to-use rubber-base paint—or write direct for details.

Cellulose Products Department
HERCULES POWDER COMPANY
966 Market St., Wilmington 99, Del.

RUBBER-BASE (PARLON)® PAINTS

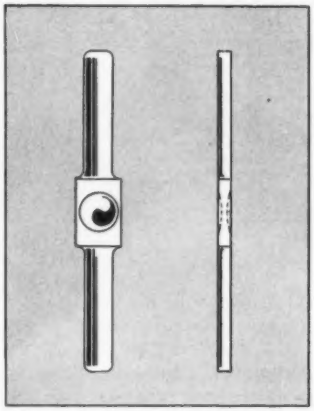
CR52-4

PLANT ENGINEERS' DIGEST

(Digest begins on page 24)

Give a light polish to the faces of electrodes with a piece of emery cloth wrapped around a dressing tool similar to that shown in the figure.

The tool is rotated between the electrodes under light pressure. This should take place just short of a

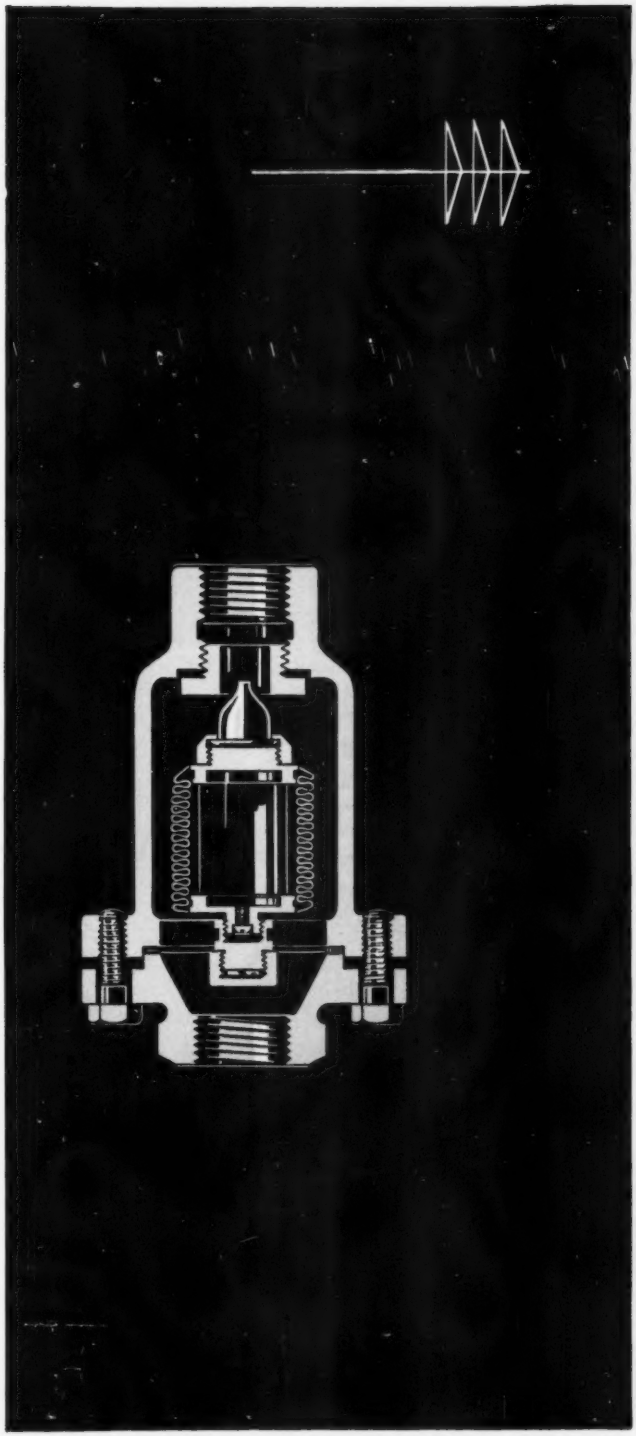


Views of suggested tip dressing tool

regular predetermined point where the electrode face contour commences to change seriously, or where pick-up starts to occur. *From Ampco Welding News, published by Ampco Metal Inc., Milwaukee.*

Centralized Safety Equipment

This novel central safety station has been installed in G.E.'s chemical materials plant in Schenectady. Such grouping tends to eliminate the danger that an employee will be unable to spot equipment in an emergency. (From a news release for Mine Safety Appliances Company, Pittsburgh, Pennsylvania.)



AIR is expensive in the wrong place

AIR IN STEAM
spaces cannot supply useful heat. The temperature of a mixture of air and steam is always lower than that of pure steam at the same pressure.

This is equivalent to operating at a lower steam pressure than was intended in the design.

AIR AND OTHER NON-CONDENSIBLES
in the steam space form an insulating film on the condensing surface.

A FILM OF AIR
only 1/1000" thick will offer the same resistance to heat flow as copper 19" thick.

It has been found in practice that 1% of air can reduce heat transfer by as much as 11%.

THE REMOVAL OF AIR
from a piece of steam heated equipment is a sure way of shortening the warming-up period and improving surface temperatures, thus increasing production and reducing fuel consumption.

JUST AS 30 YEARS AGO
we pioneered individual steam trapping based on sound engineering principles, so now we have made available a complete line of Balanced Pressure Thermostatic Air Vents, especially designed for scientific air removal.

LARGE AIR VENTING CAPACITY
When starting up, the large seat orifice is wide open giving free and rapid discharge of initial air. This balanced pressure type allows air which collects during operation to be discharged regardless of operating steam pressure and temperature.

For full information on where and how to apply air vents to speed production and save fuel, write for Bulletin 275-3.

SARCO saves steam
improves product quality and output

SARCO COMPANY, INC.
Empire State Bldg., New York 1, N.Y.
REPRESENTED IN PRINCIPAL CITIES
Sarco Canada Ltd., Toronto 8, Ont.

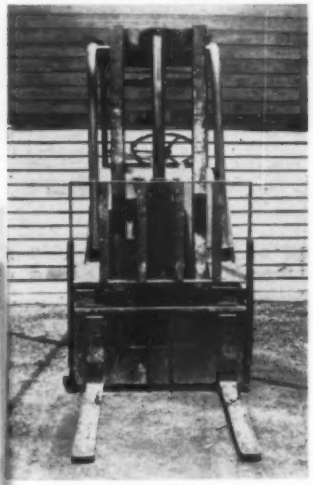
410

OPERATION & MAINTENANCE of industrial service and production facilities

Edited by H. E. B. Anderson

September's Third Prize Winner — Shortened Forks Increase Lift Height

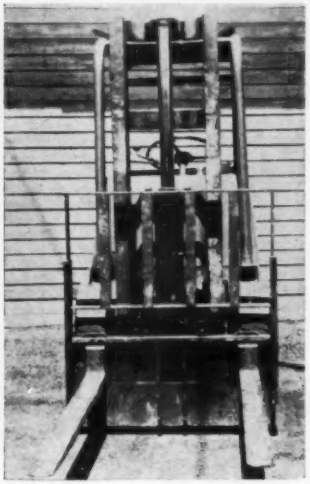
Submitted by James Burns, American Cyanamid Co., Linden, N. J.



The total lift of our yard fork truck was just 6 in. short of the second floor height of two of our buildings. It was therefore necessary to tie up an additional truck in the yard each time that material received was to be stored on the second floor of one of the buildings.

Cutting off 12 in. of the uprights on one pair of forks provided the key to the extra margin of lift height required. With the forks thus shortened, the fork flats are 12 in. higher in relation to the fork backing plate, therefore are that much higher when the truck mast is completely elevated. This extra lift height permits the use of the yard truck, with only a quick change of forks, when deliveries to the second floor level are involved.

Though these forks are usable primarily in these instances, the fact that the one truck can handle all the lifts required in the yard, including the two story one, overshadows their use limitations.



September's Fourth Prize Winner — Fabricated Take-up Bearing Bracket

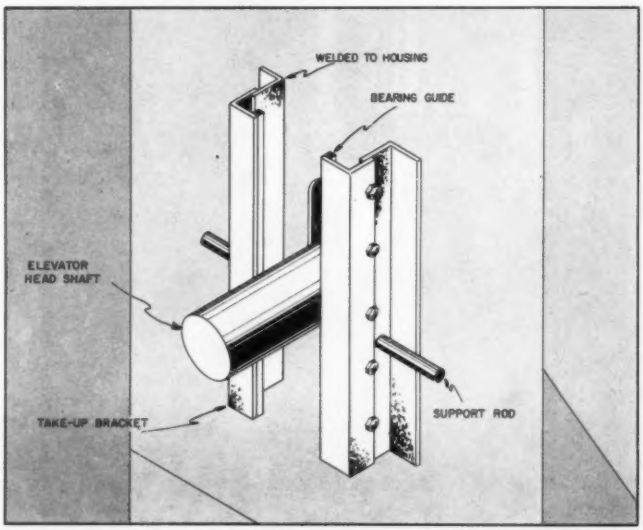
Submitted by J. E. Nissley, Tobacco By-Products and Chem. Corp., Richmond, Va.

A SPECIALLY-DESIGNED bearing take-up bracket, used on a bucket elevator head shaft, simplifies the removal of the bearings for repair or replacement. Ordinarily, such removal requires rigging to support the shaft, chain and buckets. Also, the bolts which secure the bearing bracket to the housing must be removed by working inside the housing.

In the proposed design, each side of the slide bracket utilizes two lengths of angle iron, bolted together in a squared Z shape. One leg of the Z is secured to the elevator housing, adjacent to the shaft opening in the housing. A length of bar stock welded to the other leg forms the bearing slide.

Just above the minimum position of the bearing, a hole is drilled horizontally through both sides of the bracket. This hole provides an opening to insert a steel rod under the shaft, to support the bucket assembly when the bearing is removed. The use of a rod for this purpose precludes the use of rigging above the elevator housing, to support the shaft during the bearing removal.

To remove a bearing from the slide bracket, the rod is inserted under the shaft, and the shaft is lowered onto the rod by using the adjusting screws on the bracket. The bolts that hold the two angles together are then removed. With the guide angles thus loosened and removed, the bearing can be slid off.



This bracket design removes the hazard of rigging above the elevator housing, and the necessity of working inside the housing.

ALLIS-CHALMERS COMPLETE DRIVES

Simplify

YOUR DRIVE DESIGN PROBLEMS

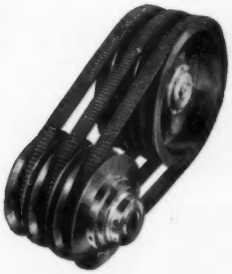
Allis-Chalmers Matched Motors, Control and V-Belt Drives Save Design Time and Cut Installation Cost

CONTROL

Complete matched control for any motor, including manual and magnetic starters, pushbuttons, and variable speed control.

MOTORS

Standard open drip-proof, splash-proof, totally-enclosed, fan-cooled and explosion-proof, ½ hp and up. Also wound rotor and direct current. Special motors to meet your requirements.



Texrope V-BELT DRIVES

Fixed speed and *Vari-Pitch* sheaves with stationary or motion control. Famous grommet belt construction. Most complete line of V-belt drive equipment in the industry.

Get the Kind of Help You Need

Allis-Chalmers representatives in every industrial center are at your command. Just call the office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin for helpful literature.

Allis-Chalmers Motors and Control	51B6052
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A-3780

ALLIS-CHALMERS

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OPERATION & MAINTENANCE

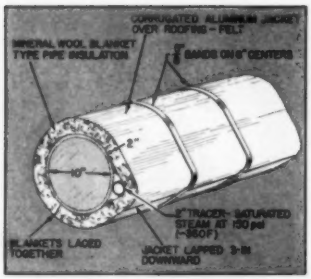
(O and M begins on page 46)

Blanket-Type Insulation For Steam-Traced Oil Lines

ENGINEERS commonly specify blanket-type mineral wools as the most efficient, economical and easily applied pipe insulation for installation on the irregular contours of steam-traced pipelines. Because of its flexibility, blanket-type pipe insulation may be rapidly and closely fitted to such pipes as two steam-traced fuel oil lines at the General American Tank Storage Terminal, Argo, Ill.

Two 10-in. oil lines are insulated and traced by parallel 2-in. steam pipes to prevent temperature drop. Maintenance of higher oil temperatures insures low viscosity and facilitates pumping and handling in transit.

The insulation, as described by the Industrial Mineral Wool Institute, consisted of blanket sections, 24 in. long and 2 in. thick, with wire mesh facing on both sides, wrapped around the two pipes and laced together with 16 gage galvanized metal wire. A 28 gage corrugated aluminum jacket, with an asphalt-felt weather-proof liner applied to its inner surface, was then wrapped around the blankets. This jacket was lapped down 2 to 3 in. against the weather to prevent moisture entry and banded with 5/8-in. galvanized metal bands on about 8 in. centers. The diagram indicates how the insulation adapts itself to the contours of the adjoining pipes.


CORRUGATED ALUMINUM JACKET OVER ROOFING - FELT
MINERAL WOOL BLANKET TYPE PIPE INSULATION
BANDS ON 8" CENTERS
2"
10"
2" TRACER- SATURATED STEAM AT 150 psi (~366°F.)
BLANKETS LACED TOGETHER
JACKET LAPPED 3-IN DOWNWARD

Insulated oil line section illustrates method of covering steam tracer line

Cutter Reverses Itself as Wrench

A SPECIAL WRENCH made from a used cutter is used to remove similar cutters from rivet shavers. The wrench was developed as an improvement over the accepted methods of removing cutters. These methods often resulted in damage to the cutters, and sometimes required the dismantling of the entire shaver to remove the cutter. High maintenance costs and unnecessary machine down-time were a costly result each time difficulty was incurred in removing a cutter.

The wrench is made from a used cutter by removing the cutting tip, then welding the cutter to a T handle made of drill rod. The slot left by the removal of the cutting tip fits over the cutting tip on the cutter in the barrel of the rivet shaver, making it possible to quickly engage and easily unscrew the cutter from its shaft. Cutters may also be inserted in the shower in the same manner, reversing the tool.

Photo: Temco Aircraft Corp.

Special wrench in position to unscrew cutter from drive shaft of rivet shaver

Vent Valve Prevents Siphoning, Stops Corrosion

Contributed by Chester Smith, Atlas Powder Company

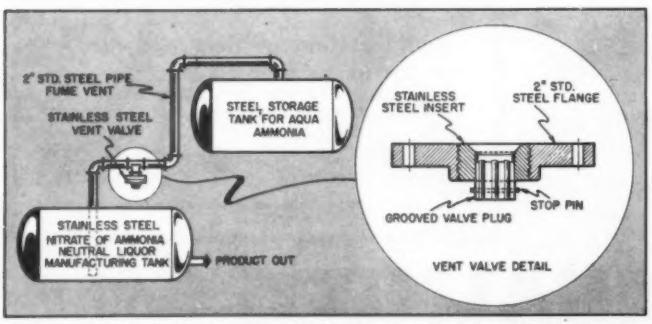
AT A PLANT producing nitrate of ammonia by neutralizing aqua ammonia with weak nitric acid, a 40 ft run of 2 in. steel pipe corroded and required replacement every 4 months.

The neutralizing operation is performed in a stainless steel tank, and at the end of each operating day the weak nitric acid is run into the stainless tank for storage until the next operating day.

The aqua ammonia is stored in a steel tank located above the neutralizing tank to provide gravity flow of the ammonia into the neutralizing tank during the process. A 2 in. steel vent pipe runs from the top of this ammonia storage tank to a riser in the neutralizing tank. This riser extends below the surface of the weak nitric acid stored in the tank.

During non-operating periods, warm weather builds up pressure within the ammonia storage tank. This pressure is relieved through the 2 in. vent pipe, with the ammonia fumes being absorbed by the stored acid. Cold weather, however, tends to create a vacuum in the ammonia tank, and the nitric acid is sucked into the vent pipe, and corrosion of the pipe occurs.

The installation of a shop-built stainless steel vent valve stopped the corrosion entirely, by breaking the vacuum and ending the siphoning action of the nitric acid through the vent pipe.


2" STD. STEEL PIPE FUME VENT
STAINLESS STEEL VENT VALVE
STEEL STORAGE TANK FOR AQUA AMMONIA
STAINLESS STEEL NITRATE OF AMMONIA NEUTRAL LIQUOR MANUFACTURING TANK
PRODUCT OUT
STAINLESS STEEL INSERT
2" STD. STEEL FLANGE
STOP PIN
GROOVED VALVE PLUG
VENT VALVE DETAIL

Stainless steel vent valve (inset) stopped siphoning of nitric acid through vent pipe between ammonia tank and neutralizing tank shown on flow diagram

Waterproofing of Plant Floors

Contributed by H. N. Josleyn

WATERPROOFING of floors, with a minimum loss of production time, can be made positive and enduring by the use of a combined membrane and hard cement construction. This method is equally successful on new floors, old cement floors, or floors of firm wood construction.

The cement floor to be repaired is cut down about 2½ in., depending upon the final desired floor level. Any pipe sleeves, floor drains or machine floor studs that go into or through the floor should be sealed in with pitch.

On this depressed surface, 36 in., 30 lb asbestos roofing paper is

"DEAD STORAGE" AREA AT NIGHT . . . . . TRANSFORMED INTO ACTIVE MARSHALLING YARD BY G-E OUTDOOR INDUSTRIAL LIGHTING

Small investment in G-E lighting doubles value of outdoor work areas

A LIGHT FOR EVERY NEED is available from G.E.'s full line, for example: **A** High efficiency, lightweight, easy-to-install area floodlight for crossarm mounting, with three beam spreads; **B** Heavy-duty, wide variety of mountings and beam spreads; **C** Inexpensive, open floodlight for closer-range illumination.

You can use your plant's outdoor areas just as efficiently at night as you do during the day by adding outdoor lighting. And the cost of this productive lighting is insignificant compared to your present investment in outdoor work areas.

SPEED UP MATERIALS HANDLING

Tighter production schedules, congested plant facilities, and many other factors make it necessary for you to handle raw materials, parts, and products at night. With 'round-the-clock "daytime" provided by G-E outdoor lighting, fast, efficient materials handling is made possible, with a minimum of mistakes or damage. In the plant pictured you can see how an area, almost useless in the dark, became a productive asset.

PROTECT PERSONNEL, PLANT PROPERTY

The right outdoor lighting can pay big dividends in preventing accidents, pilfering and sabotage. But it is important to get lighting that serves your needs best—money spent on inadequate lighting is often wasted. To get more information on General Electric's full line of outdoor lighting for industrial plants, write for bulletin GEA-3640, to *Section 451-172, General Electric Company, Schenectady 5, N. Y.*

OUTDOOR INDUSTRIAL LIGHTING

GENERAL ELECTRIC

Can YOU Do This?

● Do your slings give maximum safety in handling the 101 odd loads that your crane moves daily? A combination of ACCO *Registered* Wire Rope Slings, as shown above, can be used safely because all fittings and attachments have full rope strength.

The DUALOC Ending produces the strongest wire rope sling made. Two collars insure uniform strength from sling to sling. Actual strength certified by warranty certificate. Preformed improved plow steel Green Strand wire rope with steel core assures maximum resistance to kinking.

Popular sizes in stock for immediate delivery.

**Trade Mark Registered*

ACCO

WIRE ROPE SLING DEPARTMENT
AMERICAN CHAIN & CABLE

TRADE MARK

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Registered Wire Rope Slings

OPERATION & MAINTENANCE

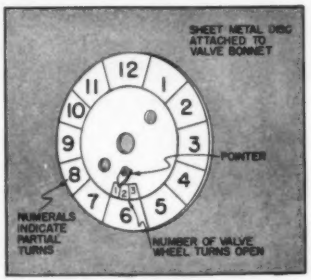
(O and M begins on page 46)

mopped down thoroughly with a 24-in. lap to give 3-ply thickness. Rag felt paper is not satisfactory because of its tendency to pulp or rot under severe conditions. Pitch is mopped under the paper, on the seams, and over the paper. In average temperature rooms, regular roofing pitch can be used, while in coolers or freezing rooms, asphalt is preferred.

Directly on top of the membrane, 6-in. mesh of No. 9 wire is laid loosely, and flattened.

The concrete, a 1, 1, 2 mix with about 3½ gal of water per yard, should be poured rapidly and continuously. The poured floor need not be agitated, but should be finished with a power float. A standard cement surface hardener may be applied after a few hours. Twenty-four hours after the floor is finished, it is ready for plant trucking.

Valve Position Indicator



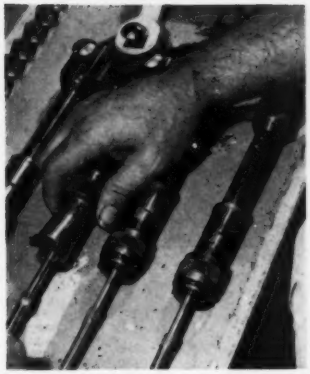
Valve position is indicated by disc affixed to valve bonnet. Pointer shows complete turns valve is open; outer scale provides base for marked valve wheel to indicate partial opening turns

Split Clamp Fits Threads

A QUICK ACTION threaded clamp used in the tubing and cable department of the Temco Aircraft Corp., Dallas, expedites the proof testing of aircraft control cables.

Prior to the development of the clamp, it was necessary to screw the threaded cable terminals into a turnbuckle for each test. With many of the cables having threaded terminals on both ends, this preparation for the test was time-consuming.

The clamp is made from a 9-in. length of bar stock. One end of the stock is cut down the center, and hinged so that it may be opened. A hole is drilled in the center of



Threaded cable terminal fits into clamp threads. Sleeve locks clamp together

this divided end and tapped for the desired thread. The threaded terminal is placed on the matching threads and the clamp is closed on it. A sleeve is slid over the split end, securely clamping the terminal in place for the test.

Battery Charging Suggestions

IN SELECTING charging equipment, a good rule to follow is to allow for one charging circuit for each truck operating according to the Edison Storage Battery Division. It will then be possible to keep the trucks adequately supplied with charged batteries for any daily work schedule from one to three 8-hour shifts a day. Since the actual time required to charge a battery does not exceed six to seven hours, it is usually safe to assume, for estimating purposes, that an allowance of eight hours is ample both for the charge itself and for taking test-fork readings, setting the charge controls, any necessary watering, etc. Therefore, it is safe to estimate that one charging circuit can be used to charge as many as three batteries during one 24-hr day.

If single-circuit charging units are selected, additional units may be installed later in case additional trucks are installed. If multiple-circuit charging units are adopted, it may be desirable to anticipate future expansion and order a machine of sufficient capacity for the estimated additional circuits. At the time charging equipment is being selected, it is desirable also to order a battery discharge panel containing the necessary switches, meters and variable resistors for convenience in cycling batteries and doing test work.

Charging benches will be needed for at least as many batteries as will be in the shop at one time, but it is preferable to have sufficient benches for every battery in operation. Then it will be unnecessary to move batteries from one bench to another

Army Type **WRIGHT SAFEWAY**

• A steel hand hoist with compact, adjustable suspension and trolley to fit various width I-beams. Designed for low overhead. Easily converted to 2-wheel geared trolley unit.

Longer-life features include: steel in all load-supporting parts; load sheaves with five formed pockets; automatic load chain lubricator; alloy steel load chain; swiveling drop-forged load hook; alloy steel, machine-cut gears; fully enclosed, self-oiling gear case.

See your WRIGHT distributor or write for Bulletin **DH-269.**

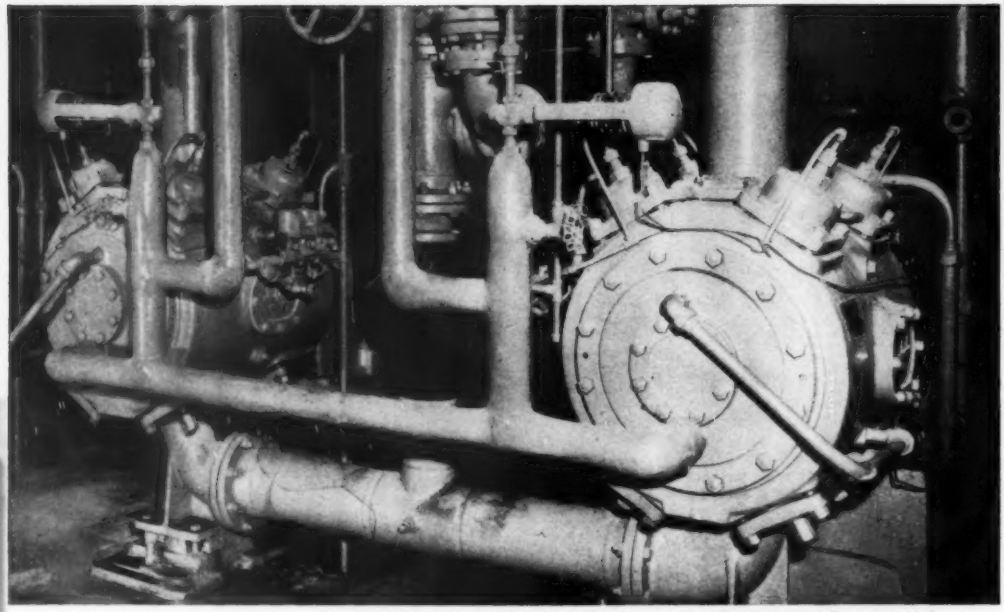
ACCO

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

TRADE MARK

WRIGHT
Hoists
Trolleys
Cranes



CONTINUOUS OPERATION of this Worthington Type DC Horizontal Compressor helps keep aureomycin production up at Lederle Laboratories plant in Pearl River, N. Y.

Compressor operates continuously to help produce aureomycin

Installed for Lederle Laboratories in 1949, unit operates at 100% capacity day and night.

No rest periods for this duplex compressor. When you're producing antibiotics like aureomycin, you just can't afford them!

The Lederle Laboratories Division of American Cyanamid Company anticipated rigorous operating requirements when they installed this Worthington horizontal compressor back in 1949.

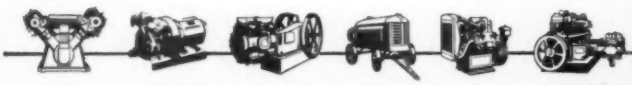
They wanted it to supply compressed air for use in the production of aureomycin—24 hours a day, seven days a week, at 100% capacity. The fact that the unit has operated since installation in 1949 with no attention other than routine maintenance is but "normal" for a sturdy Worthington compressor like this one.

This Type DC compressor has the exclusive Worthington Feather* Valve, deep, full-area cylinder water jackets, extra-large bolted gasketed clean-out covers—just some of the reasons why *there's more worth in Worthington.*

Remember Worthington's auxiliary equipment, too. Write to Worthington Corporation, Compressor Division, Buffalo, New York.

*Reg. U. S. Pat. Off.

K.2.1



No Other Compressor Will Outperform a Worthington

WORTHINGTON

Compressors

CLEVELAND TRAMRAIL

THE OVERHEAD TRACK TO
Lower Production Costs

Which of these Cranes ARE YOU PAYING FOR?

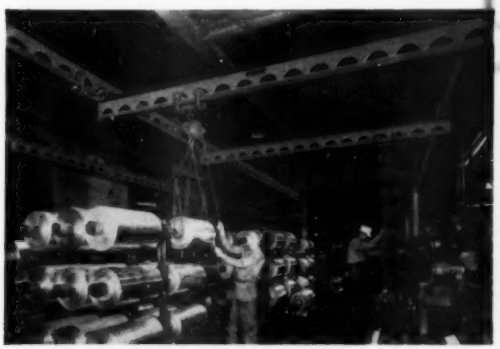
UNLESS your plant is unusually well equipped with materials handling equipment, you may in effect be making sizeable payments on one or more cranes every month through inefficient handling losses.

A large part of the time required to produce an item is consumed in handling materials entering into it. Surveys indicate that this time amounts from 25% to 50% of the total production time. Suppose additional cranes could reduce this handling time by 10% or 20% in your plant, how much would they be worth to you?

Look around your plant. Study lifts that require two or more men. Can this work be done easier and faster with a crane? Can safety be improved? Check costly time lost by skilled mechanics waiting for crane service. Analyze your warehouse and storage areas—can aisleways be used for storage? Can materials be piled higher?

Don't pay for Cranes without getting them!

5-ton cab-operated crane in warehouse.



Manually-operated cranes handling rolls of aluminum foil.

GET THIS BOOK—Write for a free copy of Book 2008. Packed with valuable information, this well-illustrated book starts you thinking of ways you can step up production and lower costs in your plant

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7596 EAST 284th ST. WICKLIFFE, OHIO

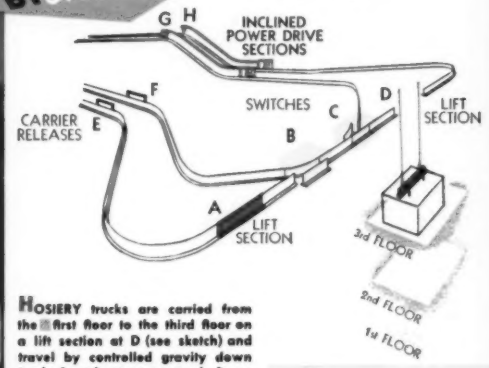
CLEVELAND TRAMRAIL

THE OVERHEAD TRACK TO
Lower Production Costs

AUTOMATIC SYSTEM HAS 200 CARRIERS . . TRAVELING BY GRAVITY

View of four tracks taken from a point near lift section J. Track 4 is at left. The two outside tracks handle carriers with loaded trucks and the two inside tracks handle carriers with empty trucks.

FLOW DIAGRAM illustrates gravity travel and power drives of system.



A Cleveland Tramrail system at Hanes Hosiery Mills Company, Winston-Salem, North Carolina, producers of ladies' nylon and rayon hosiery, is unique because while it is entirely automatic in operation, its 200 carriers run by gravity. The carriers convey and store empty hosiery trucks, handling two at a time. Following are some of the advantages provided by the system:

1. Time spent pushing and handling hosiery trucks has been drastically reduced.

2. Large storage warehouse which would be required for storing the trucks is saved because ceiling space is now used for this purpose.

3. If it were not for the Tramrail System, a new building addition would probably have been necessary.

4. An elevator on which the trucks formerly were taken from the first to third floor has been relieved of work that formerly taxed its capacity.

5. The cost of an additional elevator which would have been necessary to take care of additional trucks required because of greatly increased output, was saved.

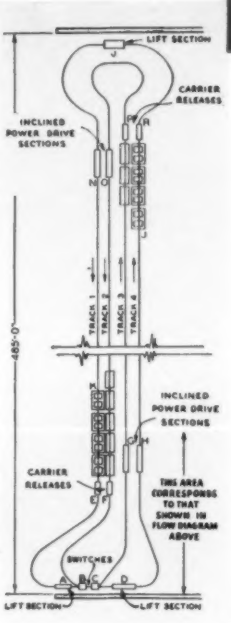
6. Costly maintenance formerly required because of hosiery truck casters wearing floors has been largely eliminated.

7. The system introduced an efficient means of handling the trucks, expedited their delivery, and greatly cut the costs of this work.

HOSIERY trucks are carried from the first floor to the third floor on a lift section at D (see sketch) and travel by controlled gravity down track 4 and return on track 1, on which they are stored until required. Trucks in storage are released at lift section A, but also may be released at J by stopping carriers passing through.

After the trucks in a carrier have been removed at A, the carrier travels through switches B and C, down track 3 and returns on track 2, where it is stored until needed on the first floor. As soon as a loaded carrier is dispatched from the first floor and leaves lift section D on the third floor, another carrier comes down and takes its place, ready for more empty hosiery trucks.

Only seven motors are required for the entire system. These operate the three lift sections and the four inclined power drives which convey the carriers to the high ends of tracks 1, 2, 3 and 4, all of which have a slight grade. Only at three points do men have anything to do with the Tramrail system: At the loading point on the first floor and the two unloading points A and J, on the third floor, and their only work is to push empty hosiery trucks on or off of the carriers, which is an incidental task done along with their regular work.



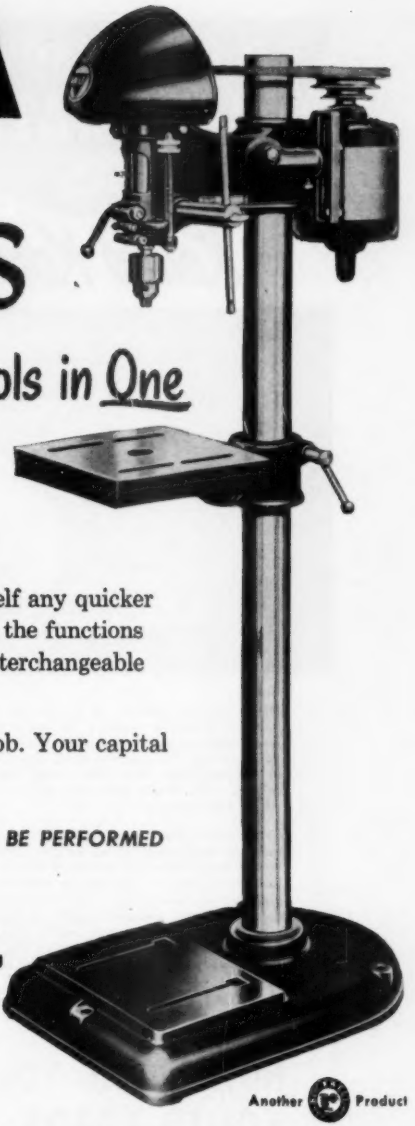
OVERALL LAYOUT OF SYSTEM

The 200 carriers travel over one-third mile of Tramrail track, with only seven motors.

GET THIS BOOK—Write for a free copy of Book 2008. Packed with valuable information, this well-illustrated book starts you thinking of ways you can step up production and lower costs in your plant

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO
7596 EAST 284th ST. WICKLIFFE, OHIO

This DELTA 14-inch DRILL PRESS



is Scores of Maintenance Tools in One

Bring the tool to the job — or bring the job to the tool

No tool in your maintenance department pays for itself any quicker than a Delta drill press. This 14-inch model performs the functions of a number of machines. With the exclusive Delta interchangeable spindle, the cutting tool *can be changed in seconds!*

A Delta drill press can easily be moved from job to job. Your capital investment is small. Upkeep is almost negligible.

SOME OF THE MAINTENANCE OPERATIONS THAT CAN BE PERFORMED WITH THIS DELTA DRILL PRESS:

Drilling
Center Drilling
Core Drilling
Glass Drilling
Paper Drilling
Counter-boring
Counter-sinking
Surface Grinding
Dowel and Plug Cutting
Planing
Reaming
Milling
Spot Facing
Tapping
Polishing
Buffing
Mixing
Wheel Cutting
Arbor Pressing
Boring
Mortising
Routing
Carving
Sanding

Another Delta Product

DELTA 14" DRILL PRESS

Available with either No. 1 Morse taper spindle or Jacobs Chuck that takes straight shank drills from No. 60 to full ½-inch. In high- or slow-speed models. Capacities up to ½-inch in cast iron. Quill has 4-inch stroke.

Also available—The DELTA 17" Drill Press

FOR HEAVY DUTY METAL WORKING AND STANDARD WOODWORKING MAINTENANCE OPERATIONS.

Available with either No. 2 Morse taper spindle or ½-inch Jacobs Chuck. In high- or slow-speed models. Capacities up to ¾-inch in cast iron. Quill has 5-inch stroke.

Send for the Delta AB-51 Catalog with full specifications covering all Delta Drill Presses.

There's a Delta Power Tool for Your Job-

WOOD OR METAL WORKING

53 Machines • 246 Models • More Than 1300 Accessories

Your Delta Dealer is listed in your Classified telephone directory under "Tools."

DELTA POWER TOOL DIVISION
Rockwell
MANUFACTURING COMPANY
602K N. LEXINGTON AVE. • PITTSBURGH 8, PA.

HERE'S HOW
JETOMATIC
USES
Koiled Kords

Jetomatic, Inc., Ansonia, Conn., recently introduced a fully automatic washer for automobiles. The spray frame moves back and forth over the car on 22 foot tracks. The whirling spray under 125 pounds of pressure, first uses clear water, next a soap solution then finally gives the car a clear rinse all in five minutes.

Koiled Kords are used to deliver power and avoid tangling, dangling wires as the spray frame travels on its tracks. Koiled Kords extend four to five times their koiled length according to their construction, and always retract to their original shape and size. The tough neoprene jacket is impervious to moisture in any form and resists the damaging effects of grease, oil, acids, sunlight and other substances and conditions that quickly hurt rubber cords.

On any electrically operated equipment that moves, use Koiled Kords.

HOW WOULD YOU USE KOILED KORDS ?

For a sample of Koiled Kord simply write for it on your business stationery.

Koiled Kords
INCORPORATED
BOX K, NEW HAVEN 14, CONN.

OPERATION & MAINTENANCE

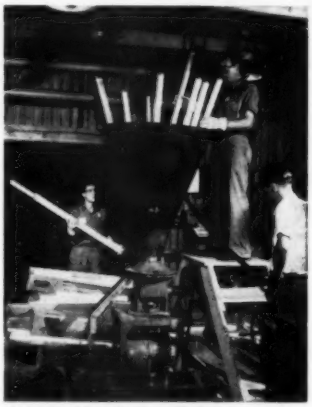
(O and M begins on page 46)

while in the shop. Every battery can have a space reserved for it and can be put in that space every time it comes into the shop. Especially in large installations, time is saved because the operators soon learn where each incoming battery is to be put and where to look for the charged battery for which it is to be exchanged.

Fluorescent Tube Smasher

Contributed by P. C. Ziemke

ADAPTING an idle carbon crusher has given our plant a means of safely disposing of burned-out fluorescent tubes. A large funnel section was added to the original feed spout



Fluorescent tubes are fed into crusher spout for safe, water-washed breakage

of the crusher, to accommodate the long tubes. Water is piped into the feed cone, to wash the glass particles and dust down through the crusher into the drain trough at the side. The discharge from this trough is collected in metal cans, and buried as scrap material.

Danger Signals for Open Window

Contributed by F. E. Riley

THE PIVOTED TYPE of window is a serious hazard when opened in the horizontal position, particularly if its horizontal axis is below the average person's height. It is very difficult to see, edge-on, and accidents have been caused by workmen walking into the corner of the steel frame. This window danger can be minimized by fitting sheet metal "signals," painted a bright color, to the upper inside and lower outside corners of the window. When the

FOR CLASSY SHOPS

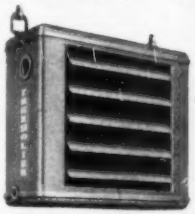
. . . OR BUSY PLANTS

THERMOLIER UNIT HEATERS

The condensed table below is a quick guide to the selection of the correct Thermolier for specific conditions. The capacities, when motors are operating at normal speeds, are based on Standard Basis of Rating: 2 lb. steam pressure and 60° F entering air temperature. Grinnell Thermoliers are tested and they are rated in strict accordance with rules of the Industrial Unit Heaters Association.

All Thermoliers can be operated at working steam pressures up to 125 psi and steam temp. up to 406° F.

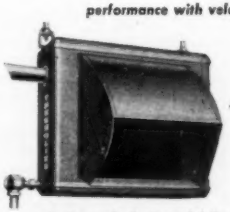
A MODEL AND SIZE FOR EVERY PURPOSE



horizontal delivery

textile (horizontal delivery)

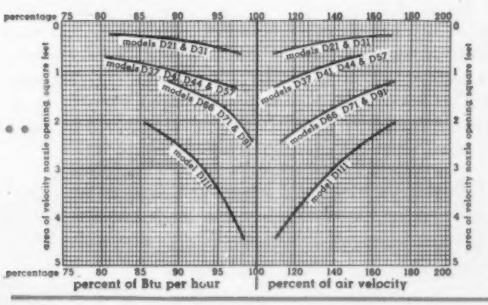
vertical delivery



velocity nozzle (horizontal delivery)

model	total heat delivered, Btu per hr	sq ft edr (nominal)	air velocity at exit, louvers open, lin. ft. per min.
horizontal delivery			
D21	35,600	148	786
D31	48,700	203	851
D37	62,200	259	753
D41	71,000	295	901
D44	84,100	350	887
D57	101,300	422	1016
D66	128,700	536	779
D71	151,700	632	977
D91	196,000	817	985
D111	275,300	1147	1048
Textile			
TX70	69,800	291	826
TX110	113,700	474	877
vertical delivery			
VA1042	50,800	212	1399
VA1045	73,600	307	1287
VA1065	109,400	456	1354
VA1075	145,600	607	1231
VA1101	185,000	770	1495
VA1111	257,000	1071	1631

performance with velocity nozzle ▶


percentage 75 80 85 90 95 100 120 140 160 180 200
models D21 & D31
models D37, D41, D44 & D57
models D66, D71 & D91
model D111
area of velocity nozzle opening, square feet
0 1 2 3 4 5
percent of Btu per hour
percent of air velocity

GRINNELL
THERMOLIER UNIT HEATERS

CALL YOUR LOCAL GRINNELL DISTRIBUTOR

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

DUSTUBE salvages agricultural chemicals

Pays for itself from values collected

at Cotton States Chemical Co., Inc. Monroe, Louisiana

Three Dustube Collectors are being used by the Cotton States Chemical Co. in the manufacture of Agricultural Chemicals. One Dustube ventilates the work areas around the blenders and "sack-off" stations. A second Dustube ventilates a mill grinding Benzene Hexachloride and DDT. A third Dustube handles exhaust air from a cyclone ventilating a mill grinding concentrates such as toxaphene and aldrin.

"We installed these collectors to regulate the dust in the air, a nuisance to us and our neighbors besides being a fire and health hazard," writes Mr. L. P. Harris, Mgr. "We are paying for the units by the values collected and returned to the products. At least $50.00 worth of material is salvaged per day in the second and third Dustubes and about a third as much in the first. We have been very well satisfied with their efficiency."

The Dustube is the efficient, low-cost way to ventilate chemical processing operations of all types. You will want to read about its 10 advantages in the new catalog, just released. Write today for your copy of Catalog No. 72-B.

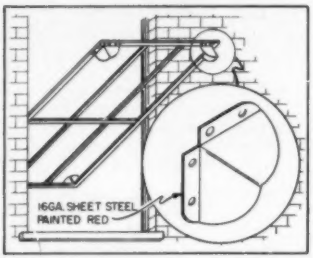
American dustube COLLECTORS

OFFICES IN PRINCIPAL CITIES

AMERICAN WHEELABRATOR & EQUIPMENT CORP., 839 S. Byrkit St., Mishawaka, Ind

OPERATION & MAINTENANCE

(O and M begins on page 46)



Sheet metal shapes fastened to corners highlight hard-to-see pivoted windows

windows are open, the signals are clearly visible inside and outside the building, and from any angle of approach, calling attention to the safety hazard.

Help for a "Stuck" Bearing

Contributed by Wm. Steindl

A SUGGESTED METHOD for freeing a "stuck" sleeve bearing from a shaft, rather than dismantling the machine to press the bearing off, requires only light oil and a compressed air supply.

The procedure is: remove the oil cup from the bearing cap and replace it with a pipe nipple; fill the nipple with a light oil; connect an air hose to the nipple and blow the oil down around the bearing. The oil will be forced into the bearing, seeping through where ordinary lubrication has failed. This method has proved successful in many instances of bearing seizure.

Air Cushion for Water System

Contributed by Charles T. Zimmerman

OUR WATER SUPPLY SYSTEM included two deep well turbine pumps, tied into a common header leading to the water storage tank. With this piping arrangement, a check valve was installed at each pump, to close off the pump column in the event of pump failure. However, when flow from a pump stopped, the backflow into the pump slammed the check valve shut, shaking all the connected piping. This shaking loosened connections and hanger installations throughout the system.

To eliminate this condition, without the expenditure for special slow-acting valves, we constructed an air cushion in the line. Capping a 20-in. length of 6-in. pipe to form an air chamber, we welded it in a vertical position in a hole cut into the top of the 8-in. pump discharge line between the check valve and

line between the check valve and the storage tank. A 2-in. check valve, on a nipple welded into the discharge line on the pump side of the check valve, served as a vacuum relief for the 100-ft column of water in the pump.

With the piping installed in this manner, the air cushion absorbs the shock of the water in the discharge line backflowing toward the pump. The valve slam, with its attendant piping vibration, no longer follows a pump shutdown.

Caulking Is Good Practice

CAULKING COMPOUND is distinctly different from putty, and should not be confused with it, according to the American Asphalt Roof Co., Kansas City, Mo. Putty is used to hold glass down fast to the frame of a window. It is applied soft, and hardens into a dry mass. Caulking compound is also applied soft, but it remains in a semi-soft condition.

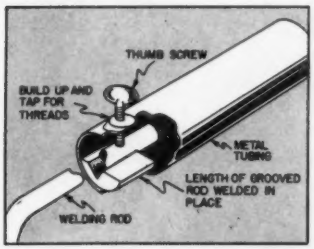
The compound itself is a blended formula of cooked oils and bodying pigments, with the following characteristics: Waterproof; good adhesion; not affected by temperature change; smooth and easily applied by hand or gun; non-hardening and non-drying; will not sag out of a crack or break away; will not discolor or bleed through subsequent paint coats; will not soften or run in hot weather.

In spite of the best of insulating practices, unless cracks around windows, doors, or chimneys are caulked properly, the full savings from the insulation will not be realized. Caulking the usual ¼ in. cracks around 30 windows will save enough fuel in one year to pay the cost of the caulking job.

Though not as apparent, or as promptly remedied, the cracks around a normal 32 in. by 62 in. window are greater in total size than a 3-in. hole in one of the panes.

Caulking compound, used to seal cracks caused by settling, shrinkage or similar actions, will prevent dust, dirt or cold air entering the building, and will prevent building damage caused by moisture seeping into the building walls.

Welding Rod Holder



Shop-made holder for rod minimizes heat and eases grip during gas welding

Try this. Bend an ordinary paper clip into the approximate shape of a cross-section of the metal plies in an Ajax Spiralwound Gasket.

Now squeeze it between your thumb and forefinger. You can feel the resiliency that lets these gaskets breathe with varying pipeline and boiler stresses. That offers safer seals at lower bolt loads. That allows the gasket to conform to warped or badly pitted flange surfaces. That usually permits an Ajax Spiralwound Gasket to be reused, should it be necessary to part the joint.

Specify this "Spring-Loaded" gasket for real gasket performance and economy. Types for all standard pipe flanges; boiler manhole, handhole and tube caps; waterwalls, economizers and pressure vessels of all sorts.

Sold universally through industrial distributors. Ask yours about them or write—

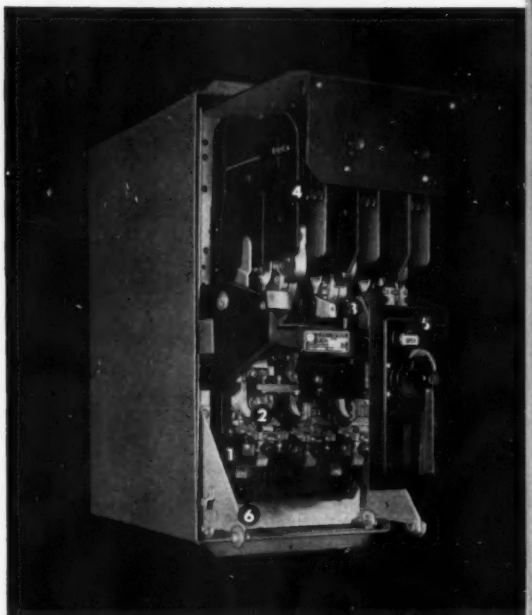
UNITED STATES GASKET COMPANY

FABRICATORS OF "TEFLON" & "KEL-F" FOR THE CHEMICAL PROCESS & ELECTRONIC INDUSTRIES

CAMDEN 1 NEW JERSEY

I-T-E Circuit Breakers

I-T-E individually-enclosed Large Air Circuit Breakers give you...



POSITIVE PROTECTION

1. *Magnetic time-delay trip* provides dependable overcurrent protection. Prevents circuit interruption on harmless overloads.

2. *Magnetic instantaneous trip* assures instant tripping on short circuits.

3. *Sturdy mechanism design* assures quick, safe closing, opening, and tripping. All poles operate simultaneously.

4. *Magnetic arc chutes* quench arcs quickly, safely, dependably—in *air*.

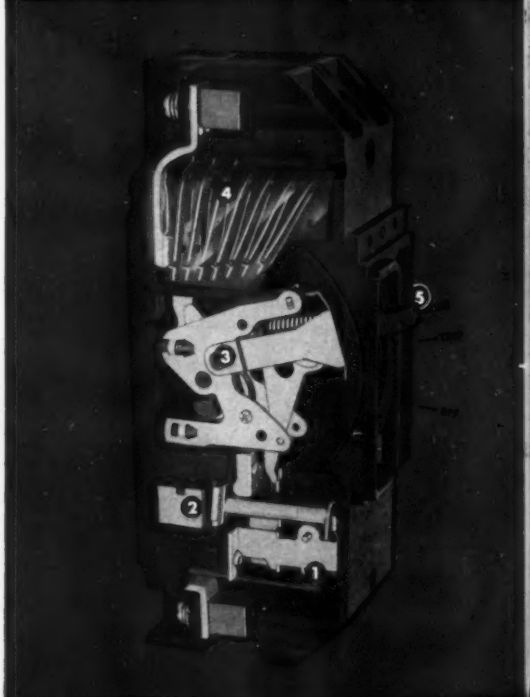
MAXIMUM SERVICE CONTINUITY

5. *Wide-angle position indicator* shows immediately whether breaker is open, tripped, or closed. Manual resetting of tripped breaker requires only a turn of the operating handle. Service can be restored immediately.

6. *Wheel mountings* allow breaker to be pulled out of enclosure quickly and easily. Rapid interchangeability permits one breaker to serve as spare for many plant circuits.

ratings: 15 to 6,000 amperes continuous
15,000 to 100,000 amperes interrupting
up to 600 volts, a-c, 250 volts d-c
Available in 4 sizes various enclosures.

I-T-E Molded Case Circuit Breakers give you . . .



POSITIVE PROTECTION

1. *Thermal time-delay trip* provides dependable overcurrent protection. Prevents circuit interruption on harmless overloads.

2. *Magnetic instantaneous trip* assures split-second tripping on short circuits.

3. *Rugged over-center toggle mechanism* assures quick-make, quick-break operation under all circuit conditions. All poles operate simultaneously.

4. *Magnetic arc chute* extinguishes arc immediately. Provides high interrupting capacity.

SWIFT RESTORATION OF SERVICE

5. *Three-position operating handle* indicates at a glance whether breaker is ON, TRIPPED, or OFF. No parts to replace when breaker is tripped. No specialized personnel required to restore service. *Anyone* can reset breaker quickly.

ratings: 10 to 600 amperes
120 to 600 volts a-c, 125 to 250 volts d-c
Manual or electrical operation
Available in 4 frame sizes, 4 different enclosures.

give 2-way "production assurance"

1 POSITIVE ELECTRICAL PROTECTION
2 SWIFT RESTORATION OF SERVICE

In planning the electrical protection of costly production equipment, you're faced with *two* important considerations:

First, you naturally demand a device that will give you the most *positive protection*—a device that will quickly take a machine *off* the line if there's an overload or short circuit.

Secondly, you want a protective device that will assure *swift restoration of service*—a device that will quickly get the machine *back* on the line after a circuit fault has been cleared.

I-T-E Circuit Breakers give you this 2-way "production assurance." Designed and built by circuit breaker specialists, I-T-E breakers embody the latest thinking and design features. Note how both the Large Air Circuit Breaker line and the Molded Case line are precision-engineered to protect you and give you maximum continuity of service. And remember, too, that I-T-E breakers provide such important extras as complete safety for plant personnel plus outstanding economy of operation.

With today's tight production schedules, no plant can afford to gamble on electrical protection. Install modern, dependable I-T-E Circuit Breakers on all your power, lighting, and distribution circuits. It's good "production assurance."

There's an I-T-E Circuit Breaker for every application...

Available in four types of enclosures — indoor and outdoor—with auxiliary and tripping devices to fit specific applications.

ratings from:

10 to 6,000 amperes continuous

up to 600 volts a-c, 250 volts d-c

up to 100,000 amperes interrupting capacity

LOW VOLTAGE AIR CIRCUIT BREAKERS

CIRCUIT BREAKER COMPANY

19th AND HAMILTON STREETS
PHILADELPHIA 30, PA.

R&IE Power Switching Equipment—R&IE Equipment Division • Greensburg, Pa.

EPD Canadian Mfg. and Sales — Eastern Power Devices, Ltd., Toronto

WHY USE 3 TO 5 TRUCKS... WHEN ONLY ONE WILL DO?

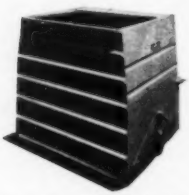
In many plants a Dempster-Dumpster, like the one above, operated by only one man, the driver, has replaced 3 to 5 conventional trucks and crews. The reason for this is that one truck-mounted Dempster-Dumpster serves scores of Dempster-Dumpster Detachable Containers up to four times the capacity of the average dump truck body. These containers are built in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids or liquids . . . trash or rubbish. Containers are conveniently located at accumulation points inside and outside buildings. To illustrate the flexibility of the Dempster-Dumpster System in handling all types of materials in your plant, we show, at right, a few of the dozens of Dempster-Dumpster Containers built to meet every bulk materials handling need. And remember, one truck-mounted Dempster-Dumpster handles all containers, regardless of capacity or design.

The Dempster-Dumpster System eliminates standing idle time of crews and trucks . . . eliminates re-handling of materials . . . increases efficiency, sanitation and good housekeeping . . . cuts cost of truck equipment and operation tremendously. Without question, it's the most efficient and lowest cost method of bulk materials handling by truck ever devised! The chances are this system will save you thousands of dollars annually. This equipment manufactured and sold exclusively by Dempster Brothers, Inc.

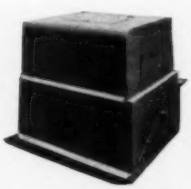
Drop Bottom Container built up to 10 cu. yd. capacity to handle heavy materials.

Tank Type Container meeting A.S.M.E. specifications. Capacities up to 1,200 gallons.

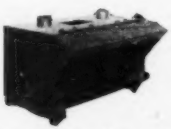
Tilt Type with Converged Lip for handling fine aggregate, wet or fluid materials.



Drop Bottom Pressed Steel Type for lighter service.



Universal Type built up to 12 cu. yd. capacity with top and end doors.



Five cu. yd. container with swivel casters for handling waste blast sand.

WHEN A CONTAINER IS FULL, the Dempster-Dumpster picks it up, hauls to destination and dumps the materials or sets load down intact. These three simple operations, shown above, are hydraulically controlled by driver in truck cab.

DEMPSTER BROTHERS - 192 Shea Building - Knoxville 17, Tennessee

Lubricate with "dag" Dispersions . . . Reduce Friction . . . Resist Heat

At virtually all temperatures experienced in hot-metal work **"dag"** colloidal graphite dispersions reduce friction to a minimum . . . keep work lubricated . . . protect metal. For brass, bronze, aluminum, magnesium, carbon steel and stainless steel . . . wherever your forming problems are friction and heat . . . **"dag"** colloidal graphite reduces one and resists the other.

Use **"dag"** dispersions:

in *wire drawing*—to assure longer die life and uniform dimensions

in *deep piercing*—to produce smooth forgings to close tolerances, reduce die damage

in *casting and mold stripping*—to insure smooth surfaces and clean parting

in *forging*—to minimize scaling and sticking, improve finish, lengthen die life

in *stretch forming*—to reduce tearing and rippling.

When **"dag"** colloidal graphite is applied to friction surfaces, it leaves a dry film that gives the metal surface an extremely low coefficient of friction, that resists oxidation, that functions far above the burning-point of conventional petroleum lubricants.

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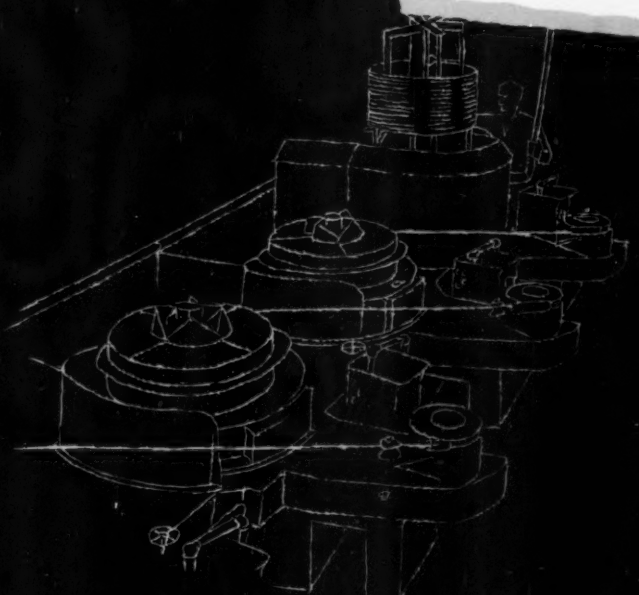

HALL LABORATORIES' SERVICE

Hall Engineers are in their second quarter-century of making water behave in industry. Their knowledge is the combined experience of Hall with all sorts of problems in all types of plants.

You can profit from Hall Laboratories' wide experience and modern equipment. The scope of Hall Service includes all phases of the use and disposal of water, for all industries.

Hall Laboratories not only understands water problems, but knows how they affect plant construction and operations. They know, too, that every problem ultimately reduces to a matter of dollars and cents. A Hall solution to your industrial water problem represents the most economical and efficient solution *for you.*

Hall Service is no farther away than your telephone.

Water is your Industry's Most Important Raw Material

for any plant water problem

HALL LABORATORIES INC. can help you take corrective action on problems of

• WATER PROCUREMENT

In a region where water rights are precious, Hall Engineers increased the flow of a plant well at a fixed drawdown from 320 to 600 gpm. by a simple, safe chemical cleaning.

• PLANT PROCESS WATER

Industry specialists associated with Hall developed an inexpensive method of reducing deposition of pitch in a groundwood pulp mill.

• COOLING WATER

When serious corrosion of process equipment threatened production of edible oil, Hall Engineers worked with Plant Engineering Department. Together, they diagnosed problem, evolved successful treatment.

• BOILER WATER CONDITIONING

Hall Engineers provide systematic and practical service to keep boilers from coming off the line because of troubles due to water. Using his nose, good sense, and a conductivity meter, a Hall man traced condensate contamination in food processing plant to leaking equipment. Repair of leaks stopped carryover from boilers.

• WATER RECLAMATION

In a complex system of plant expansions, Hall Engineers are helping to work out (1) virtual elimination of costly city water, except for drinking; (2) reduction to minimum use of well water because of dropping water table; (3) clarification of river water for process use and cooling; (4) study of all process water for maximum re-use before discharge.

• DISPOSAL OF WASTE WATER

When state sanitary authorities objected to discharging plating waste into a stream, Hall Engineers recommended and helped to adapt ion-exchange to eliminate nuisance and aid recovery of metals in critically short supply.

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HAGAN BUILDING, PITTSBURGH 30, PA.
HALL PLANT-WIDE WATER SERVICE
CONSULTANTS ON PROCUREMENT, TREATMENT, REUSE
USAGE AND DISPOSAL OF INDUSTRIAL WATER

THIS FLOW PATTERN

PLUS the FLOW TUBE for straightline flow
PLUS the ASPIRATOR which gets the inner valve open wide for peak demand
ARE ALL COMBINED IN THE
CASH STANDARD
Streamlined
TYPE 1000 PRESSURE
REDUCING VALVE

to materially cut your valve performance costs

☆

Benefits

- Maximum Capacity when needed most
- Accurate Pressure Control under toughest working conditions
- Trouble-free Service
- Smooth Operation
- Tight Closure
- Accurate Regulation
- Speedier Production Results
- Elimination of Failures
- Constant Delivery Pressure
- Cost Saving Operation
- No Spoilage
- Practically zero in maintenance costs

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With these three features—all in one valve, you are getting Valve performance that gives you cost saving benefits that begin with the installation and last for years.

☆

First, the streamlined flow around the inner valve; then the straight path for the fluid through the flow tube; then the aspirator which turns small pressure changes into large valve operating forces. These things have made the Streamliner click.

☆

Bulletin 962 features the CASH STANDARD Streamlined Type 1000 Pressure Reducing Valve—illustrates the streamlined construction and tells why you get exceptionally long, trouble-free, low-cost performance. Points out why you get no turbulence and therefore can meet peak demand at all times. Explains why straightline flow gives you maximum capacity, close delivery pressure control, and tight closure.

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
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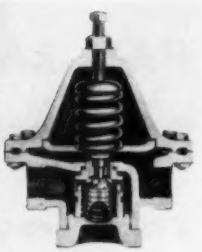
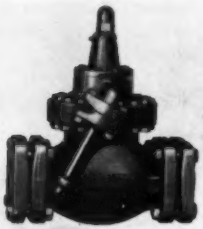
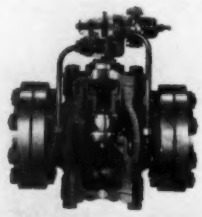


Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

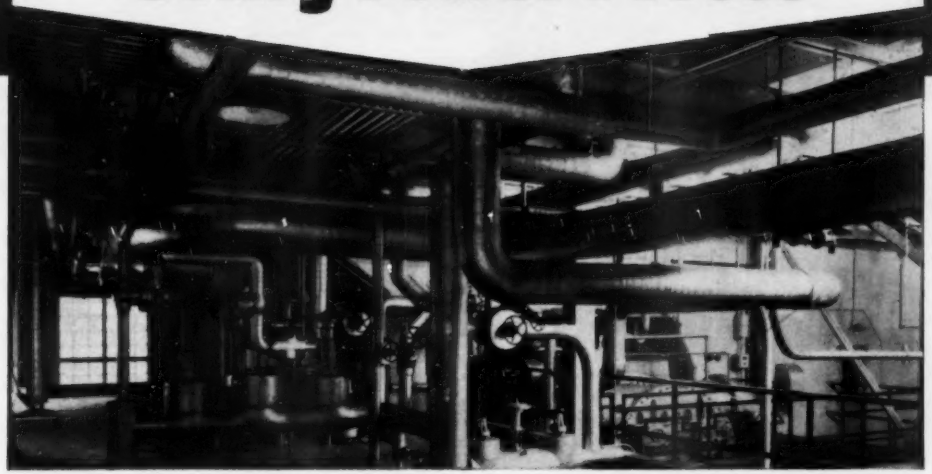


Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

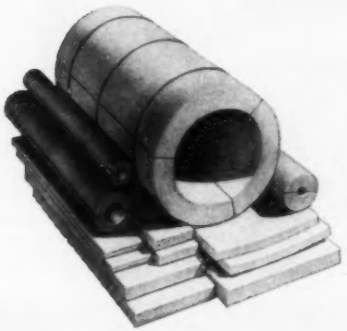


Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

Insulated Better - Using Fewer Pieces



FLORIDA POWER & LIGHT COMPANY'S Sarasota Plant where Kaylo-Insulated piping delivers steam at 850 psig 900° F. Kaylo Insulation is also used at Palatka Plant, with same steam conditions . . . and specified for their Cutler Unit 4, with turbine throttle steam at 1450 psig 1000° F. Distributor-Applicator: North Bros., Savannah, Ga.



Good Reasons Why

Leading Industries Are Switching to KAYLO HEAT INSULATION

Kaylo Heat Insulation offers advantages right down the line—in *both* performance and application.

This superior insulating material not only has an *effective* temperature range up to 1200° F., it is produced in the widest selection of shapes and sizes. With these features plus Simplified Dimensional Standards, which allow nesting, Kaylo Heat Insulation meets all operating conditions—reduces the number of pieces required per job.

Kaylo Heat Insulation is hydrous calcium silicate, *not glass*. It is insoluble in water, incombustible, and lightweight—yet strong. Easily cut and fitted, it is installed with standard tools.

For new installations or maintenance replacement, Kaylo Heat Insulation can do your jobs better . . . *at no extra cost.*

WRITE FOR FREE BOOK—"Kaylo Heat Insulation." Address: Dept. N-305, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

KAYLO . . . *first in calcium silicate*

. . . *pioneered by* OWENS ILLINOIS **Glass Company**

MAIN OFFICE: TOLEDO 1, OHIO – KAYLO SALES OFFICES: ATLANTA • BOSTON • CHICAGO • CINCINNATI • CLEVELAND DETROIT • HOUSTON • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

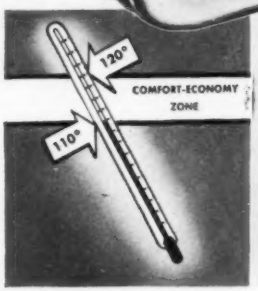
REASONS WHY

engineers rate Modine the standard of excellence

Modine steam and hot water units are built in Horizontal (illustrated), Vertical Delivery and Power-Throw models.

Four of the many reasons why Modine enjoys this quality reputation

YOU have to look beyond Btu capacity to get the most from your unit heating dollars. Modine balanced design gives you the correct combination of outlet air temperatures, volume and velocities. Your assurance of perfect heating comfort plus lower fuel costs. See the Modine representative listed in your classified phone book, or write Modine Manufacturing Co., 1563 DeKoven Avenue, Racine, Wisconsin.



Discharge air temperatures of 110°-120° F. are correctly related to air velocities. Your assurance of perfect heating comfort, lower fuel costs.

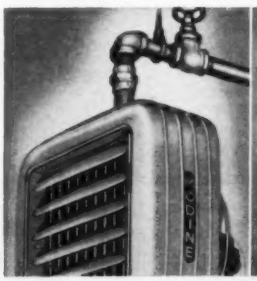
Direct-from-pipe suspension is safe and economical, with no hanger-rods. Heated air stream may be easily redirected over full 360° range.

WHEREVER GAS IS AVAILABLE, MODINE GAS UNIT HEATERS GIVE YOU LOW-COST HEATING!

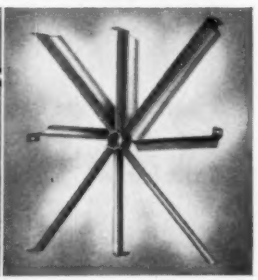
Modine is the only gas-fired unit heater with both *stainless steel* heat exchanger and burner.

Get a recommendation based on your needs. Write for facts on steam and hot water (Bulletin 149-A) and gas-fired (Bulletin 651) unit heaters.

Modine
UNIT HEATERS



Built-in velocity generator effectively steps up heat throw. This assures positive heat penetration of the cold air strata that is near the floor.



Sturdy, steel integral fan guard offers safety from exposed fan — serves as resilient, vibration-absorbing mounting for motor.

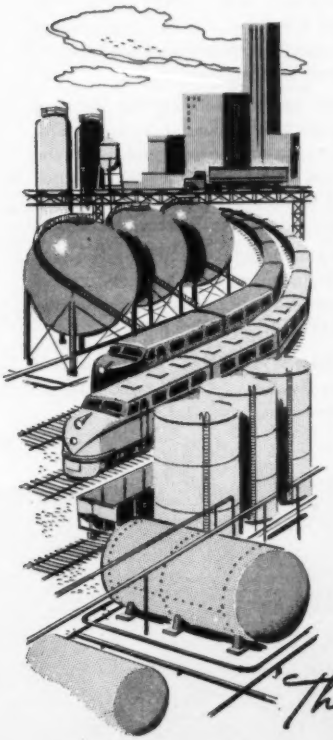
U-1163

INSUL-MASTIC

SUPERIOR Coatings

When you want to prevent corrosion under difficult conditions . . . to keep moisture vapor out of insulation . . . to control heat loss and rust with the same coating . . . to resurface leaking walls . . . you want a coating the durability of which has been unquestionably proven by industry. Here are five reasons **WHY YOU SHOULD *SPECIFY***

Superior INSUL-MASTIC *Coatings*



1. Insul-Mastic *superior* coatings provide extra long term protection. This is due to the superior ingredients from which they are manufactured and is attested to by Weather-O-Meter tests and actual field applications of many years duration.

2. Insul-Mastic *superior* coatings with their Gilsonite base are practically inert. Therefore, they are resistant to almost all acids and alkalis.

3. Insul-Mastic *superior* coatings keep surfaces dry. The moisture vapor transmission rate is only .01. This makes them ideal for vapor-sealing thermal insulation.

4. Insul-Mastic *superior* coatings can withstand temperatures ranging from −40° F., to +300° F., without cracking or running.

5. Insul-Mastic *superior* coatings contain an extremely high percentage of solids and thus, can generally be built up to their specified thickness in a single application . . . and, their shrinkage on drying is greatly minimized.

Think first of the coatings that last!

Insul-Mastic Corporation
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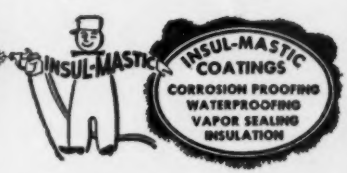

OREGON

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Pacific Gas & Electric buys additional

YARWAY

FLAT GLASS GAGES

Pacific Gas and Electric Company—a big factor in sunny California's amazing development—has used Yarway steam plant equipment a long time.

For instance, Yarway Pressure Sealed Flat Glass Gages have been specified in five of their new plants. Yarway glasses have been ordered for pressures from 1475 psi to 2050 psi. P G and E is just one of many companies who have used Yarway Flat Glass Gages for high pressure installations.

Longer gage life results from the "floating assembly" feature. Glass breakage and leakage is reduced. Newest feature is the Yarway Type M Illuminator which causes meniscus at water level to continue to *shine like a star*... even under adverse conditions.

Yarway engineers, conveniently located near you, are constantly working for better, more profitable steam plant operation. A Yarway man can help *you*. Just call him.

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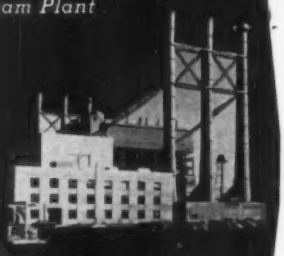
California calls for Yarway again...

Contra Costa Steam Plant



Moss Landing Steam Plant

Kern Steam Plant

UT

ARIZ

YARWAY SERVICE GOES ALL THE WAY...

Acid-Handling System Is Designed for Maximum Safety

Some of the safety features of this acid-handling system include: . . . Pressure-balancing standpipe arrangement . . . A 500 gal pressure tank . . . Special location of the main acid distribution line . . . A metering gravity feed tank . . . And the use of gasket connections on all piping

By JOHN SNEDDEN, Chief Plant Engineer, Norris Thermador Corp.

YOU CAN'T second-guess safety when you're dealing with sulfuric acids. Such second-guessing often sends someone to the hospital, perhaps disfigured for life. So when we designed and installed this sulfuric acid storage, distribution and waste disposal system—we designed it for keeps.

Besides the usual acid-handling precautions built into any system of its kind, we wanted some extras from our installation; such as: (1) the capacity to handle a minimum of 10,000 gal of sulfuric acid, 98 per cent concentrate, so we could take advantage of carload lot purchasing; (2) a self-regulating system which would shut itself off if something went haywire; (3) a distribution system whose components could be isolated for quick, safe maintenance; and (4) as little of the acid under pressure as possible—consistent with plant efficiency.

When a tank car is spotted at our 10,000 gal acid storage tank it is pressurized with 25 psi of air. Moisture is entrapped in a water trap, insuring minimum moisture in the pressuring system. A pop-off valve on the air tank guards against pressures in execss of 40 psi.

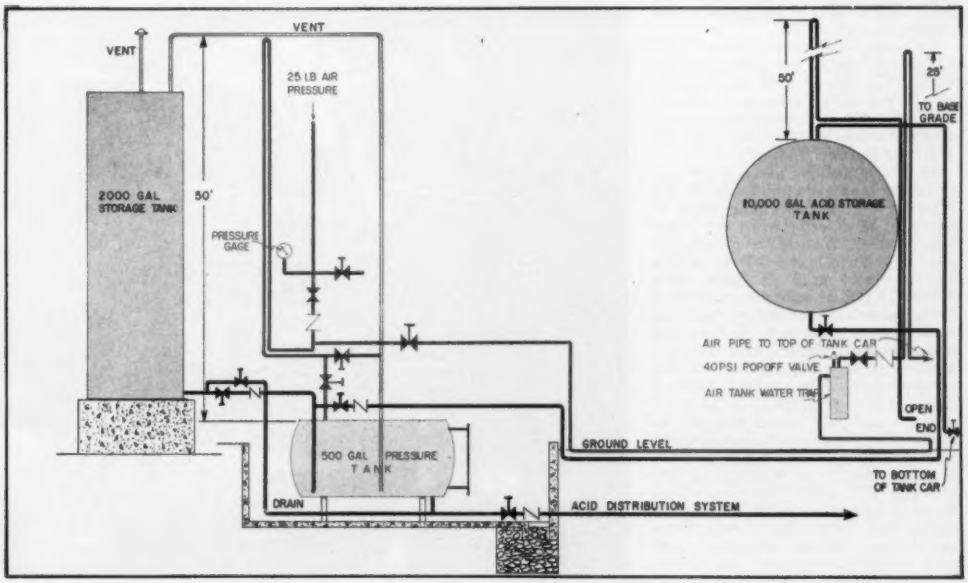
However, before air enters the tank car, it is shunted to a 25 ft standpipe, so that no acid backflows into the system. Acid flows into the storage tank, and even though an operator stands by the level indicator, the flow will be shut off by a second standpipe, this one 50 ft high, should the gages fail to indicate when "full" has been reached. This pressure-balancing standpipe, which will automatically equalize the pressure in the tank car and stop acid flow, is the first of the safety devices.

If an entire tank car load cannot be accommodated in the main storage facility, a second, 2000 gal capacity tank is filled by gravity.

The main acid pressure vessel—the only place outside the distribution pipes where full-time pressure is maintained—is the heart of the acid distribution network. This 500 gal pressure tank is pressurized to 25 psi, but air enters the tank through a third standpipe. Main distribution from the tank is by a 3 in. pipe.

One of the problems in any acid pressure distributing system is the chance that when the acid level in the working tank falls, raw com-

With present piping diagram there has not been a single accident and but one or two minor leaks since the system was installed. Black lines indicate piping carrying acid, air lines are in color, and vents are shown by open-faced lines



Gages on tanks are close to deluge fountains and other safety devices

pressed air may spurt out at the various metering boxes—carrying with it globules of acid. The present system prevents such mishaps. And here's why: The main acid distribution pipe is closer to the bottom of the working tank than the vent pipe. Thus, if the working acid level should fall below the open end of the vent pipe, the tank is automatically de-pressurized via a vent on the 2000 gal storage tank. Since there is no air pressure—there is no chance of spurting acid.

The 500 gal working pressure tank can be filled from the 2000 gal tank by gravity, after first de-pressurizing the smaller tank.

All distribution piping is painted bright yellow with a 6 in. wide red stripe every 10 ft if the pipe carries sulfuric acid.

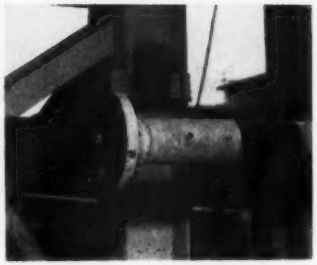
At every major sulfuric acid valve, and at all metering stations within the plant, there is a supply of (1) sodium bicarbonate in powder form; (2) sodium bicarbonate in a super-saturated solution; and (3) a deluge shower.

Metering stations at each process receiving tank are equally protected. First of all, a processing tank is never filled directly from the pressure system. Instead, a covered 15 gal, lead-lined meter box, which has a visual gage, is filled first. When 15 gal of sulfuric acid have been valved into a meter box, the valve—usually 10 to 15 ft from the meter box—is closed, and the acid allowed to flow by gravity into the process tank. Admittedly it takes a little longer—perhaps 10 to 15 minutes for each addition of acid—however, the pressurized distribution pipe is valved off. In this way there is little chance of spluttering air, charged with acid particles, which could be hazardous to an employee's hands and face. Even with these precautions, crews which do the acid filling wear plastic face masks and rubber gloves for protection.

Several carloads of sufuric acid are used weekly. That brings up the problem of waste disposal. Spent sulfuric acid is disposed of in two ways: 1. Some of the pickling solutions are pumped to a 1000 gal waste disposal tank, and from there trucked away by a commercial disposal outfit. 2. Supplementing this is a 2000 gal sump, which receives via lead-lined pipes, wash-out water, which often is from 2 to 5 per cent acid. While this waste is not as concentrated as drainage directly from active processing tanks, it is too acidic to be turned into the city sewer.

The 2000 gal sump is designed to neutralize great quantities of weak to medium-strong acid solutions, so that they can be drained to the sewers. The 2000 gal sump is continually agitated by a propeller mixer, powered by a 3 hp motor. Mixing distributes the acids throughout the solution, so that when a sample is pumped via a ½ hp motor to a pH meter, an accurate measure of acidity is obtained. The pH meter constantly records the acid strength on a circular chart. If the pH is on the acid side, a reservoir of caustic soda automatically cuts in. Adding caustic solution to the sump mixture effectively neutralizes it. The sump can then be drained to the sewer. The neutralizing caustic is a 50 per cent solution, by weight.

Other acid-handling methods include the following: 1. Storage tanks are cleaned out every 2 months with high pressure, clean water. This is necessary because a thick layer of acid sediments settle out of the acid, and this sediment can corrode the interior of the tank.



Pipe flanges on sulfuric acid storage tank lines, formerly threaded, are now welded. Gaskets between these connections mean there are fewer leaks

2. Welded pipe joints, not screw joints, are used.

3. Special acid-wise crews are on duty around the clock. Their standard equipment includes the plastic face mask, apron and rubber gloves.

4. Meter box lids are left on during filling.

5. Only low-pressure distribution systems (approx. 25 psi) are safe.

6. Raw compressed air in the distribution system is avoided—and that's where good design comes in.

7. When filling the large storage tanks by pressurizing the tank cars, we bleed the water entrainment tank prior to starting the process, and several times during the filling.

Sulfuric acid is not fed directly to process tanks by the pressure system. Instead, small quantities of acid are metered to this lead-lined gravity feed tank immediately above process vats. Workers wear rubber gloves and face protectors

Less Noise Means More Production

Industrial noises can prove detrimental to plant operations . . . Employee fatigue, possible deafness and poor production records may be the result . . . Guard against such happenings by eliminating or reducing the noise

WHEN METAL strikes metal there is bound to be noise. Here are just a few figures of a study made in particularly noisy industries to show how industrial noises affect the hearing of workers. Of 75 smiths and machinists examined, 40 per cent were definitely hard of hearing and only 30 per cent had normal hearing. Of 40 coppersmiths, only 10 per cent had normal hearing. Of 100 boilermakers, only 9 per cent had normal hearing. In another study, there wasn't one case of normal hearing among 31 boilermakers.

For purpose of comparison, the average loudness of a conversational voice is about 50 decibels, a whisper at 5 ft distance measures about 10 db, which is very quiet. On the other hand, the noise of a pneumatic drill in the street rises to 90 db, somewhat more than in a large office, where a lot of typewriters are clicking away. The average motor truck produces 70 db. The noise in the average busy street is 60 db.

In a survey made of the general noise levels in various departments of an industrial plant, the source of noise, in order of loudness, is listed:

Source	Decibel Range
Drop hammer	100-130
Rivet gun, and bucker	102-128
Pin router	104-116
Circular saw	100-116
Handforming of sheet metal	100-110
Speed hammer	96-110
Trip hammer	110
Punch press	96-108
Band saw on sheet metal	106
Air drill	92-100
High cycle milling machine	96
Public address system	90- 96
Compressed air	92
Spot weld, dimpler	88- 92
Filing	88
Hydraulic press	84- 88

The upper limit of noise where sounds begin to be painful to the ear is 130 db. Some believe the damage level of noise lies somewhere between 70 and 100 db; but, others believe that noise of less than a 90 db level should not cause harm to the hearing.

A study by the New York State Department of Labor shows that there is a definite association between the decrease of noise in a plant and the incidence of deafness among the employees.

More than 1000 workers were investigated, comprising employees of plants making tin cans, sheet metal, razor blades, and shoes. In addition, the clerical workers in these industries were also studied. The greatest incidence of deafness was found in the group subjected to a noise between 80 and 90 db.

In a plant engaged in the manufacture of steel balls, the balls were scooped up from sheet metal baskets and dropped onto metal tables. After inspection, the balls were tossed by the inspectors into various metal containers. Size inspection is performed by automatic machines. The balls are poured from the large hoppers into smaller ones, traveling through chutes to sizing rolls. The various sizes fall on other metal chutes and ultimately drop into metal boxes. The total output of noise made a terrible racket.

To abate this noise proved to be comparatively simple. All portable

sheet metal containers were changed to wood; all table surfaces were covered with plywood; and all the chutes were lined with leather.

In addition, vibration of the metal hoppers during the refilling process was decreased by refilling when half empty. This increased the inertial mass and lessened the vibration tendency. The underside of all other sheet metal surfaces over which the steel balls traveled was softened by a thick undercoating of quick drying mineralized paste. All piping was insulated, and a double wall partition was erected as a protective barrier for the adjacent offices.

For most noisy situations there are some practical and simple remedies. It is wrong to assume that workers become used to excessive noise—except on the basis of deafness. Noise in a confined space is more harmful to hearing than in the open air. The best means of getting rid of a noise hazard is to change the method of operation, for example, replacing a riveting operation with welding.

The effect of industrial noise in terms of fatigue and inefficiency has long been neglected or underestimated. In a telegraph office it was found that there was a 43 per cent reduction in errors after the noise level in the room had been lowered from 50 to 35 db.

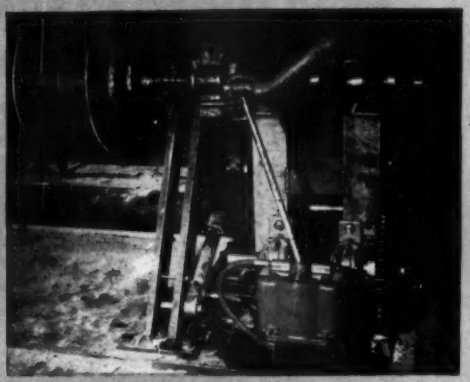
Elimination of the noise at its source by better engineering is most important in any industry to avoid occupational deafness. Faulty design of machinery, worn machine parts, improper machine mounting, improper location of machines, and carelessness in operating machinery are contributing to noise damages. The engineer rather than the doctor is in the best position to help prevent harm to the worker.

The elimination of mechanical noise can be accomplished by adopting one or all of these four methods: 1. Elimination of the noise at its source; 2. Isolation of noisy operations; 3. Reduction of noise by sound insulation; or 4. Utilization of protective devices against noise.

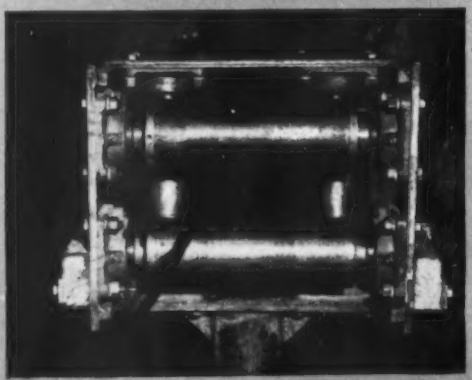
Noise-producing machinery often requires only one or two operators, but actually many workers in the nearby area are exposed to the noise, unnecessarily. The machinery should be isolated in insulated enclosures so that only the operators are exposed to the noisy machines. Workers nearby who cannot be removed to another area may be protected by suitable ear protectors. Another means of restricting the noise to the immediate vicinity is by installing acoustical material in the walls, ceilings and floors of the noisy areas.

Other measures suggested for protection of workers from noise, are: 1. Frequent rest periods to relieve the strain of prolonged exposure to noise. 2. Transfer workers from noisy jobs who show signs of a tendency toward deafness. 3. Replace them with workers who have partial deafness but who do not register fatigue when they are exposed to intense, prolonged high notes. 4. Periodically examine all personnel to determine the sense of hearing of those workers engaged in noisy occupations.

Reels from which rope is taken at frequent intervals are racked as shown in this photograph. Heavier reels are mounted on bearings and can be turned by hand or winch



Lifting a reel of wire rope from the floor presented some problems. Arms of this frame are supported and positioned by the hydraulic jacks shown



Another shop-built item which has helped in the problem of drawing rope from several reels. It was solved nicely by constructing four-way fairlead from short pipe sections

One of the major problems in the handling of wire rope at this plant was the lack of available standard fork truck attachments. Shop-built "nudger" on lift truck helps

WIRE ROPE —

IF THERE'S A PLANT ENGINEER in the U.S. up on his wire rope handling, it's H. M. Worcester, Jr., of Pacific Wire Rope Co. Since wire rope is Mr. Worcester's stock-in-trade, one of his main jobs has been figuring out labor-saving gimmicks for handling it. And Pacific Wire Rope's Los Angeles plant is alive with these short-cuts.

Basic handling problem is wire-rope's concentrated load on relatively narrow reel flanges. Not only must handling devices accept this factor, but they must be designed so that the steel cable itself is not chafed.

Unloading: For small reels, unloading pretty much boils down to a fork-lift operation, not much different from ordinary applications. However, to protect the cable from chafing, some forklifts have been rigged with special devices which fit (sometimes bolt) upon the forks—devices which are essentially half a bearing welded to a steel frame. A frame fits on each fork. The forks work on a machine screw so they can be brought closer together, depending on reel size. A short section of steel pipe is run through the reel's center, and the fork lift moves in to pick up both ends of the pipe, with the reel hanging free between the forks. The pipe ends are cradled in the half-bearings and can't slip out.

For really heavy reels the problem becomes more complicated. Pacific Wire Rope, for example, has

A hoist on a monorail is used to lift smaller reels into position in the unwinding-winding rack of the small-order department. This is standard item

It wasn't handling that caused most headaches in this department; it was the rough time that heavy reels gave to floor. Installing floor plate at points of wear has helped

Shop-Made Devices Help Handle It Right

devised a way to load and unload these giant, cumbersome reels (up to 15-tons) using two, 10,000 lb capacity fork trucks. The plant's maximum fork lift is 10,000 lb because they can best maneuver the big reels in the restricted space available.

In handling these very large reels each truck is equipped with a fork fixture, featuring the half-bearing cradle. A forklift moves alongside the reel and raises its forks until the 6-in. diameter steel pipe through the reel's center rests in the half-bearing cradle. Another fork lift takes up the same position on the other side of the reel.

Both fork lifts are equipped with the machine screw device, allowing the forks to be moved sideways until they are directly under, and in line with, the steel lifting pipe. Then, carefully coordinating their lift so that the reel's weight is evenly distributed upon each truck, the operators lift the reel and place it in or remove it from the boxcar. It's surprising how easily the big reels handle when two fork lifts, each bearing its share of the weight, team up. A greased, steel plate on the box car's floor allows the trucks, from their trackside position, to turn the reel at right angles and to shove it back into the car.

Moving reels around the plant area is simplified by fork lifts and by turntables sunk into the production floors. In rolling reels, fork lifts are equipped with special concave shoes which nudge the lower portion of the reel flanges—but which do not come in contact with the wire rope.

Production Handling: These are numerous plant-made devices for handling wire rope while it's being used on the production line. Most of these are A-frames, either mobile or stationary, and rigged to accept a steel pipe upon which the reel rides.

But what about lifting a reel from the floor into unreeling position? Pacific Wire Rope has built a simple, effective lifter, consisting of a small A-frame whose arms swing through a 45-deg angle. That is, from a horizontal, working position, to floor-height. The arms are supported and positioned by a hydraulic jack, with a 4-ton lift capacity and a 9-ton thrust.

In production use, one of the problems is how to start unwinding a reel without putting too much initial shock upon the unreeling motor. For reels in the heavy class —say 10 to 20 tons, a fluid coupling is sometimes used. This reduces the starting shock by lengthening starting time. With fluid coupling the load of initial shock is applied gradually to the motor, and the full load is not introduced until the reel is rotating at the desired speed.

In the warehouse, small reels (those up to 36-in. diameter and 5000 lb) are unwound by motors equipped with a centrifugal clutch. It is an interesting fact that the clutches are the type used on a popular make of motor scooter. The motor starts off at 50 per cent of full load speed, which is the first place on the torque curve where there's any real power. The centrifugal clutch picks up the load until there is no slippage between load and motor. Using a centrifugal clutch, a ¾ hp motor can be directly connected to a reel without undue start-strain.

Because of the wire rope reel's inherent concentrated load, it's a smart idea to equip reel areas with ⅛ to ½ in. steel plates—particularly if the traffic is heavy. Extra hard concrete floors in reel areas help too. Often the smaller reels, because of narrow flanges and high load concentration, put more load on concrete floors than the larger, wider-flanged reels. At Pacific Wire Rope, steel floor plates are sprinkled with oil-absorbing sand to cut down risk of slipping.

Warehousing: Reels should be stored vertically, on tiered uprights, the heaviest reels nearest the bottom. Reels are off-set one above the other, reaching five or six high to the warehouse ceiling. Off-setting allows free-turning no matter from which reel rope is drawn.

One problem of drawing from several reels is the positioning of snatch blocks so that rope unwinds in a straight-line. This problem has been neatly solved by constructing a stationary, four-way fairlead from short pipe sections.

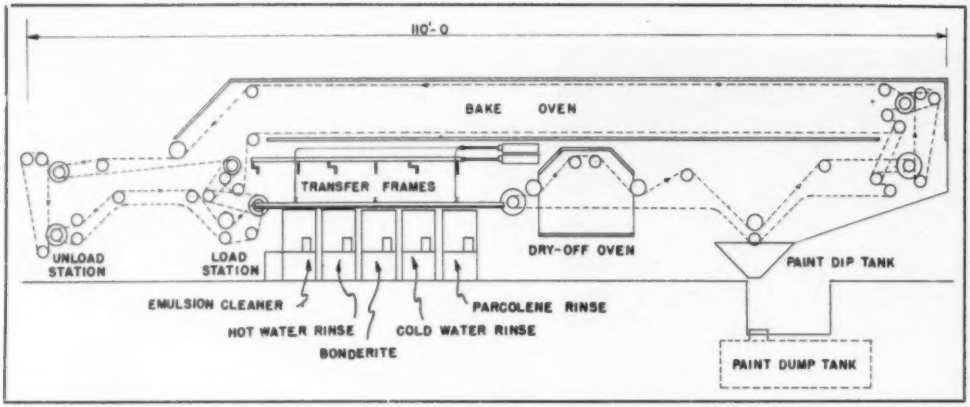


Fig. 1. This section through Bonderizing machine shows path of parts in work on conveyor at Westinghouse's Beaver Plant

Plant Engineering Department At Westinghouse Beaver Plant Improves Quality, Production

By J. L. PERROTT, Maintenance Engineer,
Standard Control Division,
Westinghouse Electric Corporation

Manufacturing and production departments produce the product but plant engineering installs, maintains and—as shown here—even redesigns and re-makes the equipment to make the product ever better and cheaper

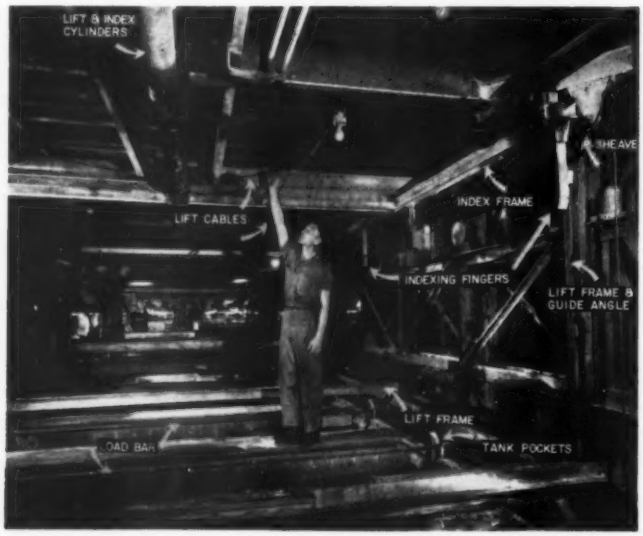


Fig. 2. Interior of spray tank process section showing the new transfer frames

THE FACT THAT the plant engineer makes substantial contributions toward increased production and improved quality has been shown at the Standard Control Division of Westinghouse through modifications of two Bonderizing machines. These machines apply a high quality, rust-resistant paint finish to an average of 250,000 pieces per month in an automatic conveyorized operation. This special finishing treatment is applied to enclosures of units such as motor starters and controllers as extra protection against corrosion by acid, alkali, and moisture-laden atmospheres.

In the Bonderizing process a thin layer of phosphate crystals is deposited on the surface of metal parts, over which a baked enamel paint finish is applied. This integral crystal layer anchors the paint to the metal, resists corrosion, and prevents accidental breaks in the paint film from spreading.

Parts to be processed are hung by hooks to transverse load bars carried by a continuous conveyor, Fig. 1. An automatic transfer system carries the bars through a series of five spray tanks so that the work remains 60 seconds in each tank with a 30-second transfer time.

After leaving the last tank, the bar is automatically loaded to the chain conveyor which carries it through a steam-heated, hot-air, dry-off oven followed by cooling time and immersion in the paint-dip tank.

From the dip tank, parts pass over a drain board and are elevated to the bake oven where gas-fired hot air bakes them for 35 min at a temperature of 300 F. From the oven the work is lowered to the unload station where pieces are removed and the bar moves on to be reloaded. The time for a complete cycle through the machine is one hour and 35 minutes.

In the original installation of these

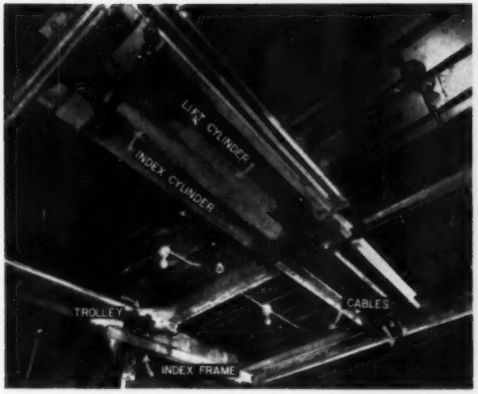


Fig. 3. Cables from lift cylinders spread to corners of frame

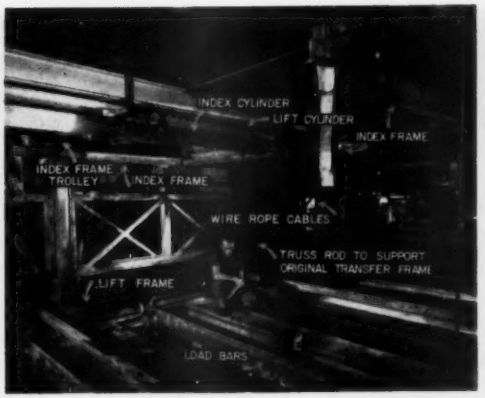


Fig. 4. Bars in tanks for processing. Truss supports frame

machines, the load bars were moved progressively through the spray tanks by a large structural steel transfer frame supported by corner trunions from four chain drives. Each chain drive worked over three idler sprockets and one drive sprocket supported by pillow blocks and moved between guides forming a rectangular chain path. In following this chain path, the transfer frame picked up the bars, moved them over the next tank, lowered them, then returned to its original position for the next cycle.

In this system of transfer, several maintenance problems soon became evident:

1. The drive chains were extremely difficult to keep lubricated in the hot steamy atmosphere above the tanks and developed excessive wear.

2. As the chains wore, the only compensating adjustment was to raise the pillow blocks, which was difficult and caused misalignment between the four supports.

3. The transfer itself was quite heavy and rigid so that any misalignment caused binding and wear of the drive.

4. Any looseness of the chain allowed jerky operation of the transfer frame, which caused frequent unhooking of parts from the bars.

To eliminate these problems, a complete new hydraulic transfer system was designed and installed in both machines. It uses two frames to accomplish the same bar motion as before: a lift frame supported and lifted by four wire-rope cables over sheaves from a hydraulic cylinder, and an index frame operated directly from a second cylinder—Figures 2 and 3.

In operation, the load bars are raised by the lift frame to fingers on the trolley-hung index frame which pulls them over the next tank. The index frame then returns to its forward position and the lift frame lowers the bars into pockets on the tanks where the pieces are spray processed—See Fig. 4. In each cycle one bar is picked up from the loading station conveyor and the bar from the last tank is deposited on the dry-off oven conveyor.

The hydraulic system powering the cylinders is shown in Fig. 5 and the built-up control cabinet in Fig. 6. As shown, all valves were mounted on sub-plates to allow quick replacement and servicing.

The sequence operation of the two frames is accomplished as follows:

1. A loaded bar reaching the pick-up station trips a limit switch which actuates a 4-way solenoid valve to direct pressure to sequence and counterbalance valves.

2. Hydraulic oil free-flows through counterbalance valve which retracts lift cylinder and raises lift frame with work. Flow to index cylinder is blocked until lift cylinder is fully retracted and pressure rise opens sequence valve. Pressure is then directed to index cylinder which retracts, moving index frame and bars.

3. At the end of index cylinder stroke a second limit switch reverses the 4-way solenoid to direct pressure to rear end of both cylinders.

4. Counterbalance valve blocks

(Continued on page 154)

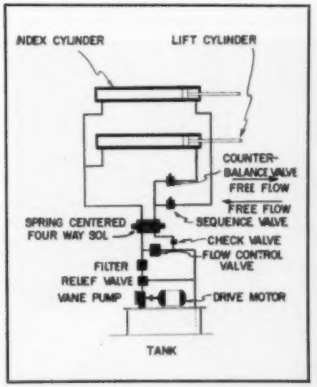


Fig. 5. Schematic of hydraulic system

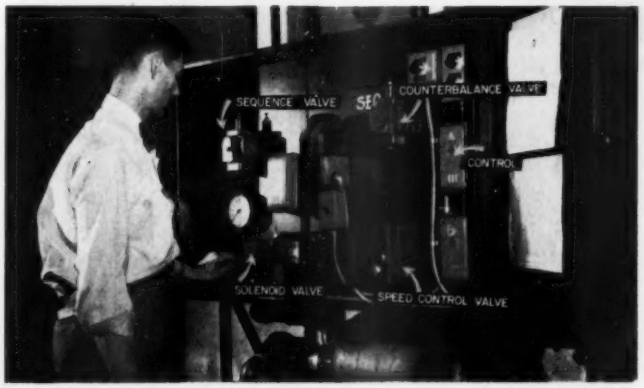


Fig. 6. Pump and control panel. Valves mounted on sub-plate for servicing

REPAIRS to

Made in 30

DO BREAKER SWITCHES die unnatural and early deaths in your plant? If they do (and we're betting 10 to 1 they do), you'll be interested in learning how those apparently "dead" breaker switches are, in one plant, restored to new life and to their old vigor in less than 30-minutes. And without even tearing them apart!

A little maintenance gimmick, based on some ideas and work by Plant Engineer Robert Hatfield of Superior Sleeprite Corp.'s Los Angeles plant, has led to a remarkable cost-cutting in breaker switch replacement. Mr. Hatfield estimates that his simple, 30-min breaker switch repair technique has saved nearly $600 a year in switch replacements.

Where before, he was accustomed to chucking nearly three dozen breakers onto the trash heap every year, now he hasn't experienced a switch loss in two years.

Like a lot of other plant engineers, Hatfield was concerned about the way his plant's breaker switches cut out—and had to be discarded.

Crux of his problem was the short-life span of 15 to 50 amp breakers which were connected to Superior Sleeprite's total load of approximately 16,000 volts.

Often, after not more than 6-months' use, a breaker would be flicked to "on" position, but the switch lever would refuse to stay cocked at "on." Instead, it would move to the neutral position and

Removal of the breaker from its mounting is job of just a few minutes

Jack knife, screwdriver and drill are the only tools needed to do this particular repair job on circuit breakers without taking them apart . . . Plant Engineer Robert Hatfield has saved nearly $600 per year in breaker switch replacements

Dig out wax covering screws in case

PLANT BREAKER SWITCHES

Minutes Without Taking Them Apart

remain there. Up until two years ago, when this happened, Hatfield threw the breaker switch out and ordered a new one. And into the ash can went anywhere from $18 to $90 worth of switch.

Then, one day, as he was about to discard still another breaker, he decided it was about time to dig to the bottom of the trouble. He opened a breaker and discovered that all that was wrong was that the little lever or tab on the trip element had become disengaged from the sliding receptacle on the "short" release.

These switches work something like a mouse trap. When the lever outside the breaker box is flipped to "on," the points make contact, and the switch is connected into the 3-phase line. When flipped to the "off" position, contact is broken. However, almost all breaker switches have a secondary element: the "short" lever. Like a mousetrap, the trip element's tab is held down by the short element's lever, which is spring-controlled. Controlling the short lever is a thermocouple, which when heated by an internal short in the breaker, pulls the short lever forward, disengaging the trip lever, and opening the contacts. Unless the trip lever and short lever are engaged, the breaker is permanently open.

Examining further, Mr. Hatfield discovered that the trip release tab became worn with use, until one day it slipped off the short lever—and that was the end of the breaker's useful life.

Carrying his research further, he found that the entire trip element was held to the breaker's plastic box by two or three screws. If these screws could be moved up only a fraction of an inch, they'd force the worn trip release tab to re-engage the short lever—and the breaker switch would be repaired. And as good as new.

He also determined that this would in no way endanger the safety factor of the shorting device—since there was still plenty of play in the thermocouple action.

Here, in brief, is the step-by-step procedure for repairing your plant's breaker switches without tearing them apart: 1. Remove the breaker switch from the gutter or from its mounting. Removing two to four screws will do the job. 2. Now, take a jack knife and dig out the wax or tar which covers the two or three screws which hold the entire trip element in place. These screws are located on the back of the breaker. 3. Remove one or two of the trip element's holding screws, but *not all of them.*

4. Working on the screw holes you've exposed, elongate them in the direction of the "off" position of the external breaker lever. Since you're working, usually, in Bakelite or other plastic, you can do the elongating job with either a small, half-round file or with a 3/16-in. drill. The only precaution necessary: don't drill too deeply, or you might drill out the threads in the holes which hold the trip mechanism to the plastic case.

5. The screw holes in the plastic case should be elongated only about 1/32-in. That's all that's needed. 6. Elongate all holes in the breaker case. 7. Now, fitting one or two of the screws into the elongated holes, set them loosely into the original threads. When all screws are in loosely, move the entire trip mechanism forward—toward the "off" end of the breaker—using a screwdriver as a pry. When positioned as far forward as the elongation allows, tighten the screws — and your breaker is repaired.

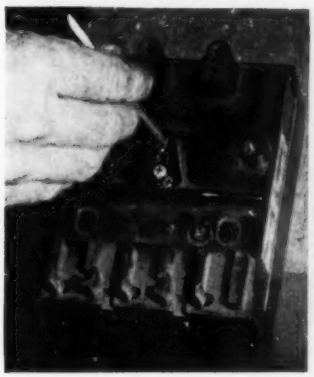
This minimum repair job, which actually shoves the trip mechanism forward only about 1/32-in., will allow the worn tab to re-engage the short lever. Your plant's breaker switch is repaired.

To test the repaired switch, even before finally tightening the trip mechanism screws, simply flip the external lever to "on." If it catches the job is successful.

Pro or Con?

Whether or not it is false economy to save money by unorthodox maintenance and repair procedures is debatable. Often there are factors of greater importance, such as safety, which enter the picture. Plant Engineering invites correspondence on this subject, for publication, from readers and manufacturers alike. The Editors.

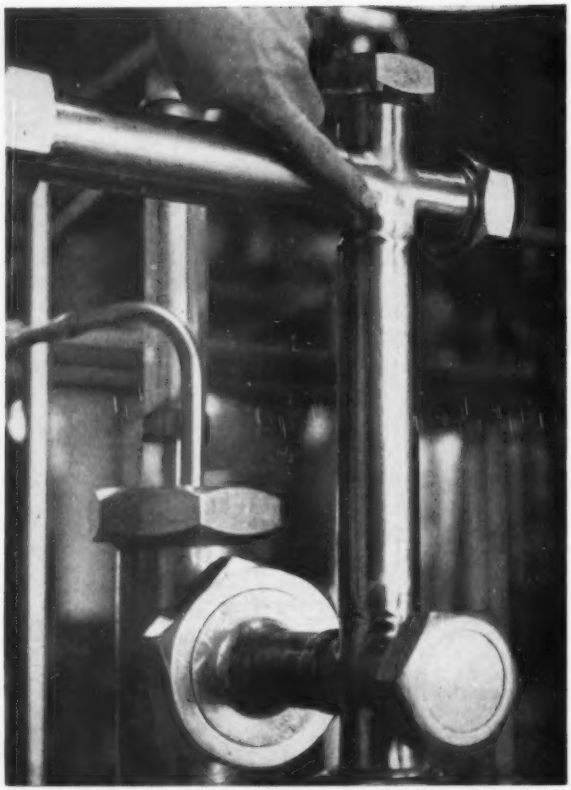
Deepen the holes with file or with drill



You won't see this; unit remains intact

Seat of the trouble is the tab shown

Food, Dairy Permanently



Typical finished and polished exterior of permanently welded joint in stainless steel piping for a dairy plant. Note the tee connection here which can be unplugged and run through with a brush at shift's end

PERMANENT, WELDED lines—a new departure in food plant layout—have simplified the plant engineer's work, cut 25 to 75 per cent off maintenance bills, meant better all-around sanitation. The same system of permanent welded lines, replacing dismountable ones, may soon be adopted in many dairy and food plants whose daily cleanup job has been a major problem.

Up until about four years, most U. S. dairies handled both raw milk and finished milk products in dismountable lines. These were dismantled daily and cleaned. Frequent handling meant nicked pipes, broken joints, and leaks. Then, some dairies turned to permanently soldered lines.

Just about two years ago another change occurred when some plants, including Pellissier Dairy, Pico, Calif., turned to permanent welded lines. The results, plant engineering-wise, have been almost immediate: 25 to 75 per cent less maintenance; longer-lived piping; better sanitation.

In no other U. S. industry is sani-

Part of the formula for a good, permanently welded stainless steel joint is a little pipe cutter beveling, but not too much. The pipe cutter is not allowed to sever the piping thereby leaving flat faces for butting

After the pipe has been partially cut through by standard plumbers' pipe cutter a hacksaw is used to finish job

Plant Engineering Easier with Welded Stainless Piping

tation more important, so it is understandable that permanent lines, whether welded or soldered, natually came slowly. Yet the adoption of welded lines — and subsequent gains in over-all sanitation—is proof that this development is sound from both an engineering and sanitation standpoint.

For example, some plants reported that from an average 500 bacteria count per cc, the count dropped to between 300-400 (often less) per cc when welded lines were installed. Leakages, always a source of wastes, have been eliminated.

Pioneer engineering reveals that soldered joints can't compare with welded ones for sanitation and long-time wear. Soldered lines were ruled out after: 1. It became apparent that no matter how good the soldering job, pockets and voids formed, especially in the interior of the joint. These collected milk solids, made cleaning difficult, were objectionable from a sanitary viewpoint. 2. Neither lead nor tin solder form sound joints with stainless steel and remain always the weakest link in the lines. Tensile strength of joints was low. 3. Silver solder and other common types have thermal expansion coefficients which allow contraction-expansion, eventually weaken or break at the joint.

It was a new technique—or rather adaption of old welding techniques to special sanitation problems — which allowed use of permanent welded lines in the milk processing plant.

These welding techniques involve: First, a new way to grind and buff the interior pipe at the weld, removing weld metal and voids. Second, methods for finishing the sanitary pipe weld. And, third, standardization of pipe.

Newest departure in welding permanent lines is an internal grinding-polishing head, which is pushed into the permanent line to the weld on the end of flexible or non-flexible extension. The grinding head is cylindrical, has three spring-loaded leaves, which hold hones of aluminum oxide abrasive, usually No. 80 grit for the grinding job. Heads are powered by a ¾ hp step-pulley-drive grinder motor turning the head at 4500 rpm.

Steps: 1. A length of stainless steel pipe is measured carefully to fit the installation, then held tightly in a vise or jig. A plumber's pipe-cutter, which imparts a bevel, is revolved around the place to be cut. The bevel is about 1/16-in., which acts to make the pipe, at the bevel, a gauge higher. Pellissier's piping is standardized to 2-in., 16-gauge and 1½-in., 18-gauge stainless steel. About two-thirds of the piping is the 2-in. variety, the rest 1½-in. dia.

The pipe cutter is not allowed to sever the pipe. Instead, when almost through, the cutter is removed, and the pipe is cut the rest of the way by hack-saw. This helps enlarge the bottom of the beveled "V," eliminates voids, and allows more weld metal in this crucial area of the joint.

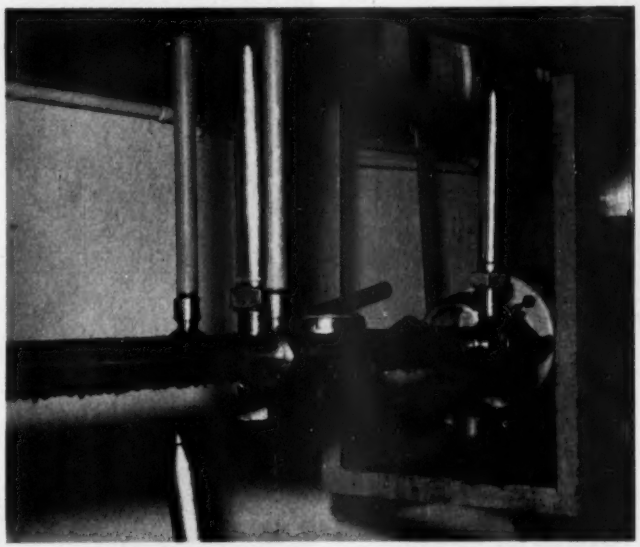
Once cut and beveled, the joints are set-up in jigs, and tack welded in 6 to 8 places. Then the arc welding is completed.

The cylindrical head is next used, grinding the interior weld. Care must be taken to grind from the highest point of the weld, until it is even with the lowest. Number 80 grit, used for grinding, is then replaced by No. 120, depending on how much polishing is desired in the pipe's interior. Exterior weld finishing is done with a hand grinder.

The effect of this careful welding, using the interior pipe cylindrical head, is to leave no voids, only a smooth, contiguous weld. Less chance here for contamination.

The pipe is hung from galvanized pipe racks installed in front of the various milk processing tanks. These racks not only act to suspend the permanent lines from the floor (and suspend them semi-rigidly), but protect pipe from tools dropped during daily maintenance. Dropped tools have in the past accounted for nicks in the delicate stainless steel lines. Process piping is suspended on hangers about every 3-ft of its length.

Before welded pipe was introduced into the milk processing industry, the process piping was dismounted each night for cleaning. Now, the only sections removed are



Some permanent welded piping at a typical dairy. Piping is hung from galvanized pipe racks installed in front of the various milk processing tanks; the racks not only suspend the permanent lines, also protect them from falling objects

the short-run hook-ups from the main permanent pipe to various fixed-positioned milk handling machines. These short-runs are usually ells—which are easy to clean. Seldom are their lengths more than 24 in. In almost all cases, ells are used wherever possible with tees next in line of popularity. Crosses are used only where absolutely necessary, since they are more difficult to clean.

Daily clean-up time has been drastically reduced. Instead of disassembling all piping, only the short-run sections are dismantled. These are cleaned separately from the main system.

Cleaning: First, lines are rinsed for 10 min with warm water, 105 F. Second, inhibited-acid solution is forced through the lines for 20-30 min at 145 F. Third, lines are rinsed and cleared. Fifth, chlorine sterilizer (enters at 350 parts per million, exits at 200 parts per million) is run through lines for 5 min at 105 F. Sixth, lines are rinsed and cleared. Tanks holding the various cleaning agents allow chemical reuse after the chemicals have been brought up to sanitizing strength.

How sanitary are permanent lines? Some dairies report that the bacteria count dropped from 500 per cc to about 300-350 per cc after welded lines were installed.

This seems to show that maintenance-wise, the less handling of sanitary lines in dairy plants, the better, so long as the lines are properly installed in the first place, with special emphasis on initial welding. One of the old bugaboos confronting dairy plant engineers — daily dismantling of all process piping—has been licked. The maintenance bill for replacement of battered and leaky pipe, especially weak joints, has been cut to a negligible figure. Except for the short-run removable sections connecting dairy apparatus, almost no replacement may be required for years of operation. Unsightly and wasteful leakage from joints has been eliminated.

It is likely now, since the dairy industry (always slow to adopt new practices until proved absolutely sanitary) has gone over to welded lines, that other kindred industries will do the same. From a dairy plant engineering viewpoint it is the most progressive step in a long time.

Exterior weld can be finished and polished with abrasive wheel on flexible shaft

On welds near open end of pipe simple grinding and polishing wheels do good job

Keep Your Copy Intact

Readers wishing tear sheets of any article appearing in the issue for their personal file may obtain them by indicating the item desired on one of the post cards appearing in this issue. — Editors

Plant Engineering Department Is Landlord at Pan American

By keeping an account on the maintenance costs of the many departments that Plant Engineering oversees, they can quickly see when costs in any one department get out of line . . . With this card system, they can closely control direct and indirect labor and materials costs

By W. E. ADAMS, Plant Maintenance Superintendent, Pan American World Airways, Latin American Div., Miami, Florida

MOST LANDLORDS can indulge in a little "buck passing" to the plumber, the decorator, or the contractor. But the plant maintenance department at Pan American World Airways, Latin American Div., Miami, Florida, is not only the landlord but is the electrician and the contractor, as well. It has however, succeeded in shifting most of the work onto a card accounting system that unfeelingly tabulates who did what—and to whom.

Why System Was Adopted

The present system of accounting maintenance costs resulted when Plant Engineering was cut from 283 employees to 160 in three successive cuts during 1949. It was necessary to reduce costs. Only by knowing what each function cost could it be determined where and how costs could be reduced. What was needed was a method to determine for whom work was done and cost of each type of work.

Although all buildings and land are actually leased from the Port Authority of Dade County, for the purpose of accounting and tabulating on International Business Machine cards, it is assumed that plant maintenance owns and operates the entire plant and rents space and facilities to all other departments. Plant Engineering is landlord over about 40 acres of buildings.

Under the card system there is an accounting sheet kept for each "tenant." How much time spent on each function is tabulated.

Direct labor and indirect labor is charged to each tenant according to use. Indirect labor includes overtime, sick leave, holidays, vacations, supervision, administration and clerical, and engineering (engineering equipment).

Direct material actually used includes people used from the outside. Indirect material includes such items as expendable tools (supplies which go into the job).

Allocated costs added to the above include use of accounting department, automotive equipment (maintenance); percentage of power and percentage of rent of any department involved.

Such charge practices refer only to maintenance and not to capital additions or new plants.

What Rent Includes

All mechanical equipment, compressed air, plumbing, power, air-conditioning, ventilation, lighting, building maintenance, painting and cleaning—of a basic or routine nature—are included in the rent paid Plant Engineering. Anything other than "routine maintenance" is charged to the tenant. One room in the accounting department was so noisy, for example, that acoustical materials had to be installed on walls and ceiling—at an additional charge.

Major departments paying rent to Plant Engineering are: aircraft service, component overhaul; general and administrative; service of supply (warehousing); and Latin American Division departments (such as traffic, public relations, operations, line stations). Plant Engineering does work for Miami terminal (other line stations also send work to Miami or a man may be loaned, to Havana, for example).

Rentals vary. Different values have been placed on the structures under lease by the Port Authority; further, more is charged for air-conditioned space than for non-air-conditioned. Rent is based on space and service rendered, including certain hidden items such as insurance and depreciation. Bulk warehouse space may be as low as 40c a square foot per year and executive office space may run to $2.50; space in the hangars averages about $1.50.

Items of Expense

In offices, the largest single item of expense is cleaning—it happens every day; in the shops and hangars, utility maintenance, plumbing, electricity, compressed air lines, make up the largest item of expense.

Some permanent structural changes are capitalized and paid for over a period of years by the requisitioning department, example: installation of new partitions. The big cost accounting job is to keep an accurate check on the extras. Plant Engineering must be able to prove the validity of the extra charge, for its tenants are more likely to react like a mother-in-law, a father-in-law, or a relative than a corporate entity.

Like any other rental agency, Plant Engineering has to show a profit: in this case, based on a budget. If the department is ahead a couple of dollars, the score is perfect; if behind, some charge has to be increased or some service curtailed; and if too much profit is being made, a basic reduction in rent takes place.

Extra charges are based on a direct man-hour cost, plus an over-

About the Author

Bill Adams graduated from Swarthmore College in 1935, with a BS degree in Civil Engineering. After two years with National Park Service, he went with the Chief Airport Engineers office as a port engineer in New York for five years. In 1942 he was attached to the Miami Base for work on Pan American's major airport construction program in Latin America. In 1948 he was assigned as project supervisor for establishing the Component Overhaul Base in Miami. With this job accomplished, he took over his present assignment as plant maintenance superintendent in 1949.

Left: All charges for services by the plant maintenance department are recorded on small cards by the operators. Right: This machine—printing information from the cards—makes out monthly reports for services to each department

head factor which includes vacation time, sick leave, holidays, engineering, supervision, shop supplies, and charges made to us for purchasing, stores, accounting and a percentage for our share of rent. Currently this overhead factor is 80 per cent. Therefore, if a man swinging a pick for an hour is paid $1.50, an additional 80 per cent charge would be billed his department, or a total of $2.70. This overhead charge is figured for a quarter and is adjusted every 3 months to keep Plant Engineering out of the red.

One of the most troublesome cost factors solved by the card system was in the field of automotive equipment maintenance. Plant Engineering is responsible for the disposition and maintenance of 12 gas-engine driven hydraulic pumps for testing; 10 flat-bed, gas driven platform trucks; 3 electric cranes; 8 runabout trucks, not including highway equipment; 33 ground power units, ranging from 200 to 1700 amp; 20 fork lifts, ranging from ½- to 7½-tons; 55 scooters; 31 tractors from 1200 lb draw-bar pull for baggage loading to 10,000 lb draw-bar pull for moving planes. In addition there are 20 stationary engine-driven fire pumps, besides other generator and diesel equipment which has to be maintained.

Such equipment is apt to be used by any department although not every department would use all types. Under the card system, each department pays its pro-rata share of automotive equipment maintenance, depending upon use.

This aerial view shows the buildings that are serviced by the plant maintenance department. Plant Engineering offices and shops, communications center, flight and ground training and chemical laboratory are located in building 134. Other buildings shown are for engine overhaul, shipping and receiving warehouses, etc.

How Study Reduced Cost

An example of how such a study helped to reduce costs was found in reviewing the tabulations for scooter maintenance. It was found that labor on scooters averaged $35 a month. Causes of this high maintenance cost were found attributable to overloading; work that didn't need to be done; and work that was not directly in line with company activity.

Sometimes a scooter would be brought in for minor repair and would end up going through a routine overhaul; at other times it would be brought in for an overhaul and it would be decided to repaint it. By confining the work to what was required, and by lengthening the time between routine overhauls, and by some educational attempts to reduce abuses, scooter maintenance cost was reduced one-half.

Repairing scooters has a blanket IBM number which is stencilled on each piece of equipment. In going through the shop, the cost (labor and materials) is charged to the number which is stencilled on the equipment.

A weekly direct labor report, including total direct labor charged to each customer by each crew, is made up for study. An indirect labor percentage is added to each direct labor charge. The current factor is 11 per cent.

If anything appears to be out of line, an abnormal charge or an unusual materials cost, it can be im-

mediately checked with the shop or with the department originating the order, and corrections applied where needed. Reductions in maintenance costs of other automotive equipment resulted from the same continuing study.

At the end of each month Plant Engineering gets runs from the IBM machines tabulated by customer, by function and equipment. From the information on these cards, rental charges are made.

How Number System Works

On the punch cards, a five-digit number system is used. For example, take the number 51362. Five is the Plant Engineering number; 13 is the customer maintained, in this case the component overhaul department; 6 is the crew number, equipment repair; and 2 is the equipment repaired number, in this case a motor generator.

By pin-pointing just what was generating the higher costs, it was possible to investigate reasons for those costs.

Under this card system it is possible to run off tabulations by type of work done, and also by departments requisitioning work. Work done by different crews can also be tabulated. Every operation or element involved is thereby broken down for appraisal. This has enabled Plant Engineering to make savings in the work throughout the plant of several hundred acres and almost 4000 workers in 3 basic ways.

One, it is hard to tell a foreman that he has too many men on a job, but when you point out that a certain simple job is averaging 18 man-hours—he checks that one out himself. In this way you can work backwards from man-hours required to do a certain job to an over-all figure of men and hours including indirect labor costs.

Two, much work born of spur-of-the-moment ideas is automatically and self-consciously eliminated when accurate cost probabilities are presented. The "I want this built" (and when it doesn't work) "I want something different built" type of experience is lessened because the total cost of all experiments is added in, which gives the complete cost.

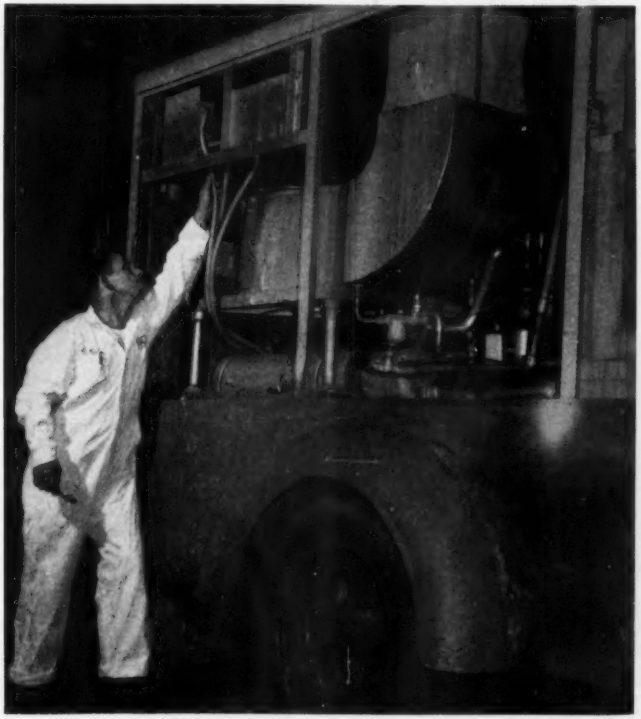
Three, materials costs, as well as labor are controlled. The system puts the spotlight on excessive costs where and when they occur. In the same way equipment maintenance costs are reduced: improperly handled equipment is reflected in unusual maintenance time or repair materials costs. Any item out of line is promptly checked. Explanations are made. This has a psychological effect of making everyone conscious of the right way to do things.

The mistaken or wrong action may not be seen—but the resulting cost stands out on the weekly or monthly report.

It was this system that enabled the plant maintenance department to take a steep cut in personnel, and yet absorb an increase in the jobs occasioned by an increase in the number of tenants.

Fleet of power units supply power when planes are on the ground. Various generators and battery cart (right) help on the ground to keep planes in the air

This motorized air conditioner is just one of the many items requiring maintenance. This unit is used to cool the planes while they are on the ground



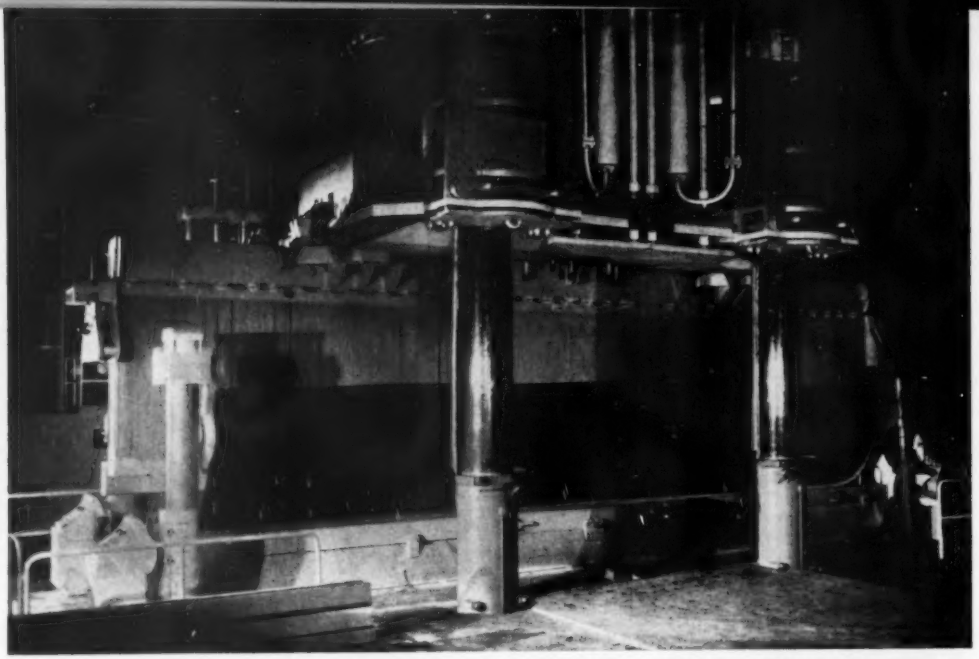
Industrial Conservation

PRESENTED IN this 14 page pamphlet is a guide to conservation engineering practices aimed at saving on the cost of goods produced by industry.

This pamphlet covers the following subjects: a program for in-plant conservation; how to organize an in-plant conservation program; operation of a coordinated conservation activity; and how you can join the industrial conservation movement.

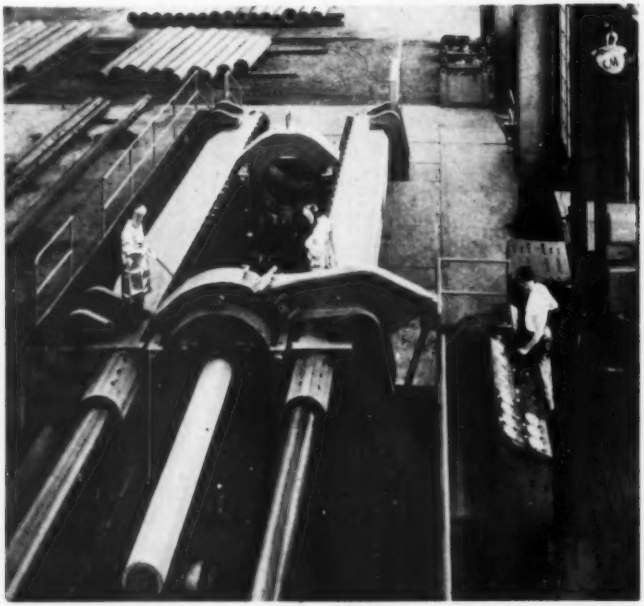
This pamphlet will be followed as soon as practicable by separate bulletins, each covering a specialized conservation technique for individual plants.

Anyone interested in this pamphlet and more information on the program may write to Conservation Division, Defense Production Administration, Washington 25, D. C.



The heaviest steel plate ever rolled is formed into a boiler drum section at Barberton plant of The Babcock & Wilcox Co.

B & W's Big New Equipment Means "More Power for America"



In drawing hollow forgings on draw bench the forging is forced by the mandrel through a series of ring dies to produce desired and predetermined inside and outside diameters. Pressures of 600 or 1200 tons can be selected for forward stroke

WITH THE COMPLETION, this year, of the Company's planned $30,000,000 expansion program, The Babcock & Wilcox Company will have created several "firsts" in equipment and facilities for boiler manufacture. Two of these were unveiled recently. They are the vertical hydraulic press and the horizontal draw bench featured on these pages.

Perhaps the most dramatic of the two is the press, built almost entirely in the Barberton shops of B&W where it is installed. However, both pieces of equipment will, because of their versatility, accelerate the fabrication of steam generating equipment and hold down costs.

Among the various types of work done on the multi-purpose equipment are the forming and fabricating of two vital types of boiler parts. The press will bend heavy plate for boiler drums and will also be used to pierce ingots which will then be transferred to the draw bench to be formed into hollow forgings for boiler headers and other parts.

Boiler drums for high-duty central station units are fabricated by welding together a number of sections formed from heavy plate. The number of sections has a direct influence on the time and cost of fabricating a drum.

The new Barberton press is capable of bending plate up to 42 ft long. As it takes approximately as long to bend a 10-ft section as a 42-ft length, the savings in forming a drum 84 ft long from two 42-ft sections, as opposed to many shorter sections, are readily seen. Furthermore, with 42-ft sections, only three circumferential welds are necessary to form a complete drum as against the 10 welds necessary when 10-ft sections are used.

This results in substantial economies not only in fabrication but also in X-raying welds to prove their soundness. In addition, it permits more effective use of highly skilled technicians to further increase productivity.

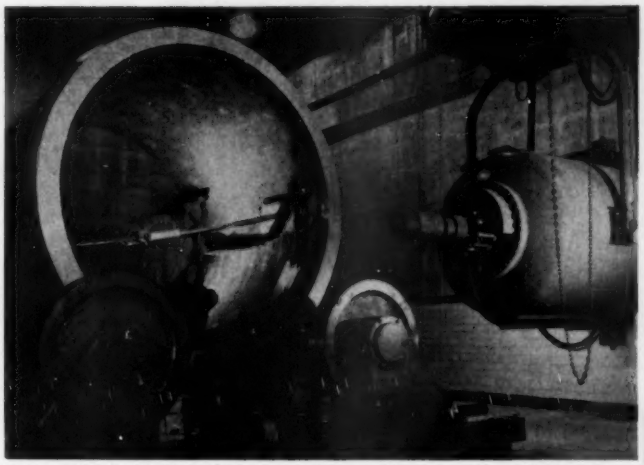
To help electric utilities hold down costs by utilizing high temperature-high pressure steam, future boilers are expected to require drums with walls even thicker than those now in use. The new press, which is capable of bending boiler drum plate thicker than any other current equipment, will enable B&W to meet these future requirements.

The same increasing demand for steam to produce power more efficiently has also resulted in a growing need for seamless, heavy-walled hollow forgings for use in making boiler headers and connecting steam lines. The new horizontal draw bench brings to America for the first time a fast method of manufacturing these forgings in larger and heavier sizes.

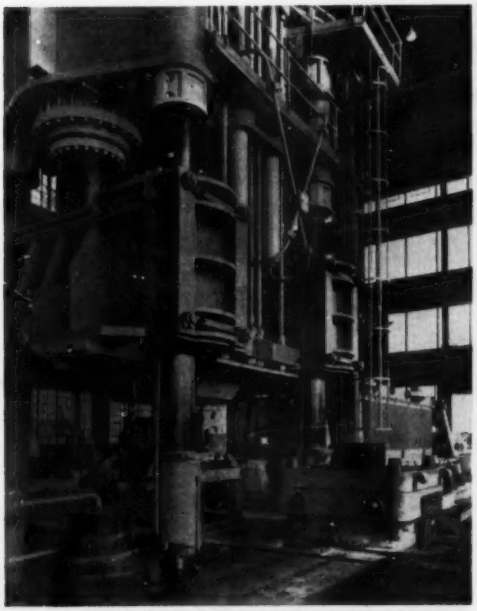
Until now such hollow sections could be made only by the costly and time-consuming process of forging large solid ingots and then boring out the centers. Heated ingots can be removed from the furnace, pierced by the hydraulic press, and drawn through a series of ring dies over a mandrel on the draw bench to form a rough hollow forging in a few minutes.

Seamless hollow forgings will be produced by this new equipment from a minimum of 8 in. inside diameter and ¾-in. wall thickness, up to a maximum inside diameter of 26 in., wall thickness of 4½ in.

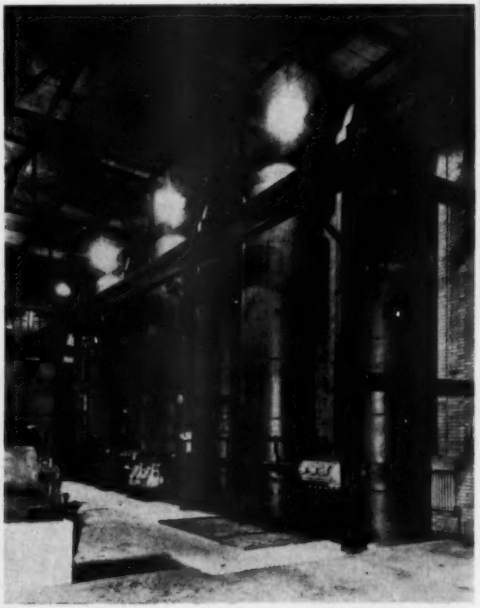
Under previous methods of manufacture it was not economical to produce such forgings in runs of less than 350 ft of a given material and size. As ring dies on B&W's horizontal draw bench can be changed quickly, one or two lengths of a particular size, shape or thickness of a hollow forging to a desired material specification can be produced at very little unit cost per forging for the changeover.



Securing film inside drum prior to examining welded seam with 2,000,000 v x-ray



Vertical press (top photo, opposite page) set up for ingot piercing, first step in forming hollow forging. Ingot is placed in piercing pot (right) which slides under press



Seven accumulator bottles, five for air and two for water, for the hydropneumatic pressure system which activates press and draw bench. Equipment is located in power plant

BEFORE Stock sheet steel was handled like this. Skids of steel were unloaded from freight car and piled along the wall to be used as needed for production

AFTER This is how the sheet steel is now stored. Boards are placed between groups of sheets. Such storing permits higher piling, and keeps aisles clear

Standardize Stacking—

THE ENGINEERING Products Materials Handling Division of RCA Victor Division, Radio Corporation of America, Camden, N. J., has set up a program for simplifying handling methods by establishing standard procedures for palletizing and packaging material.

This department attempts to standardize materials handling procedures wherever possible. However, if there is some special problem involved where the product requires special design and provisions for special handling, the case is handled as an individual problem. This individual treatment may be necessary for a very fragile item or one of unusual shape.

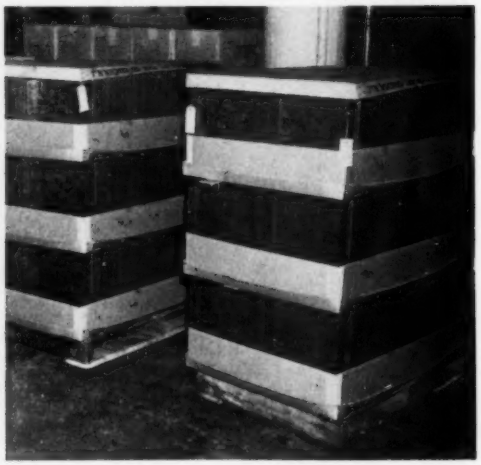
All packaging is grouped in standard quantities so that a count of the pallets or other handling units will quickly give a count of the product or parts to speed physical inventories. Pallet loads are also arranged so that they weigh about 1000 lb each. This permits a simple and quick estimate of weights.

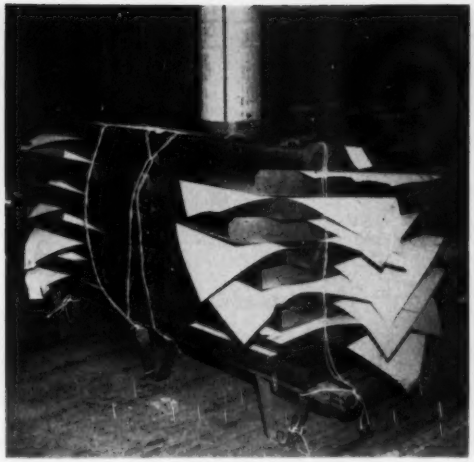
Problems are brought before the Engineering Products Materials Handling Division in one of several ways: In one instance, it may be a new job to which plant process people call their attention and ask their advice on how to process and handle an item through all plant operations.

The Materials Handling Division will make a study of all the factors involved and present their plan based on standard basic facilities available in the plant.

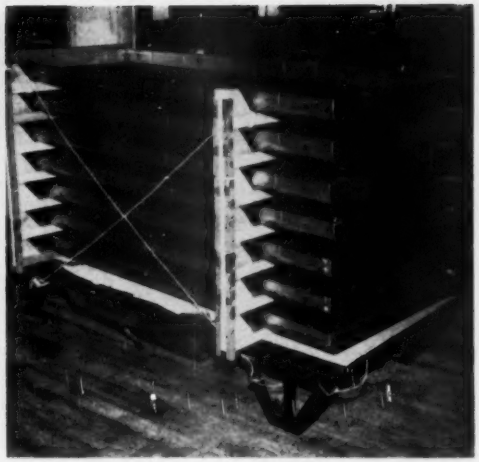
BEFORE The chassis were laid on skids by machine operator, piled one on top of another, bound with cord and moved to the shipping room to be packed

AFTER Chassis are now stacked end to end in paraffin-coated corrugated trays and collars. After trays are secured with tape, they are ready for shipment





BEFORE Finished transmitter doors, panels, sides and end rails were wrapped in paper to protect the finish. Occasionally, the paper would stick to the finish



AFTER By using an interlocking frame, all wrapping and padding operations are eliminated. This frame protects the finish and eliminates physical handling

Simplify Handling

In another case it may be a problem that the Materials Handling Division tackles on its own: Since the standardized materials handling program was initiated a little over 3 years ago, there are many cases where old jobs have not been fully studied and engineered to meet the new procedures. Because of this, the Division backtracks and tries to analyze the problems in the light of the new techniques and suggests any corrections or improvements where necessary.

The special "tray-pak" (shown in one of the photographs) was designed by the Materials Handling Division to simplify the packing and handling of certain products. The trays come in two sizes, one is 42 by 30 in., and the larger size is 42 by 48 in. The height of the sides of the trays varies to fit the particular item to be handled. Standard heights of trays used are 2, 4, 5 and 8 in.

This unitized method of handling parts has proved flexible and effective and has broad application to many items in the plant. Formerly, the items were packed in separate cartons. Now parts are packed in a group and a cover is placed on top. With this new method of using trays on a pallet, both packing and unpacking have been made easier.

These special trays, the unique interlocking frame, and the cardboard stiffener and collar separator for the cones, are just a few of the many stacking ideas which have resulted from this standardization program.

BEFORE Television tube cones were piled one on top of another on pallet, and strapped in place. Many times jarring would cause contents to spill out

AFTER The problem was solved by using a scored cardboard stiffener through the center of the cones. Paper collar separators between cones prevent damage

As an excellent furnace insulator: Two pounds of the material packed to a 6 lb per cu ft density fill the same volume as 14.6 lb of high grade refractory insulating brick. But the 2 lb of fiber furnish the insulating efficiency of 20.9 lb of the brick

VERSATILE NEW FIBER —

High Heat Refractory, Efficient Filter, Chemical Resistor

A NEW MAN-MADE fiber that promises to solve many critical industrial and defense problems has been unveiled by The Carborundum Company. The new material, "Fiberfrax," resists temperatures that melt cast iron, yet its fineness is such that it can be used as a super-filter, or as a base for entirely new types of insulation, and fireproof and electrical papers.

The unique combination of properties of this fiber opens up a host of industrial and defense uses. At the present time, for example, it is finding applications as high-temperature insulation in combustion and exhaust systems of jet engines; it is under study by the Office of Naval Research for use in highly specialized papers; it can replace or be combined with critical asbestos in many electrical and thermal uses; it can be bonded into insulating panels that will not only resist fire and prevent heat loss, but will also deaden sound. As a filter, "Fiberfrax" fiber can improve the efficiency of gas and fume filtration.

Its inertness makes possible cleaning and reuse of the material without loss of filtering efficiency. Studies of potential use indicate that the

POSSIBLE APPLICATIONS FOR THIS REFRACTORY FIBER

THERMAL INSULATION

1. Loose insulation for furnaces and other high temperature applications.
2. Bonded or packed in containers to specified density for furnace insulation.
3. Formed into insulating blankets for jet engines and furnace insulation.
4. Loose or batt form as fireproofing for safes and containers.
5. Loose as packing for expansion joints and kiln cars.
6. Formed into paper-like bodies for wrapping pipe and other parts requiring high temperature insulation.

REINFORCING AGENT

1. To strengthen electrical insulators.
2. As a support for catalysts.
3. As a base for sprayed or electrolytically deposited metals to produce porous structures.
4. To replace asbestos in brake linings.
5. To reinforce battery plates.
6. With resins, to form body armor and similar glass-fiber plastic materials.
7. As foundation for sprayed-on ceramic films or coatings.
8. Film or reinforcement for glue or resin coated articles.

RESILIENT SUPPORT

1. For vibration dampening.
2. As a foundation or support for articles being fired or heat treated.
3. Cushioning material for shipping containers.

PAPER

1. Filtration of gases.
2. Filtration of liquids (transformer oil, etc.)
3. Electrolytic insulation and dielectric, as in capacitors.
4. As wicks or other capillary bodies.
5. As heat insulation.
6. As fire curtains or packings.

MISCELLANEOUS

1. As a diffusing medium (high corrosion resistance).
2. As a filter aid, probably in the pulverized condition.
3. As a surface combustion support.
4. Bonded into acoustical tiles.
5. Flame arrestors.
6. As a flame filter to remove ash, as in gas turbines.

This listing does not represent all possible uses for the fiber. Nor is it intended to imply that all of the above are even remotely practical. It presents a compilation of suggestions, many of which are untried.

material may be suitable for heavy-duty brake linings, as the strength-supplying component in formed plastic laminates like radomes and body armor, in high-temperature gasketing, for vibration dampening, and as a flame filter to remove ash in gas turbines. In many applications, its light weight—as manufactured it weighs only 2 lb per cu ft—will prove especially advantageous.

Pilot production equipment now in operation can produce the material at the rate of 60 tons a month. It is so new that exhaustive properties tests have not been completed and are still under way.

"Fiberfrax" fiber is adaptable to the refractory markets, because its high heat resistance, light weight, and low heat transmission make it competitive with insulating refractories for industrial furnace insulation. But its attendant properties: filtration efficiency, electrical characteristics, sound-deadening ability will, according to Harry C. Martin, Director of Research, make it desirable for use in the aviation, electrical, papermaking, and chemical fields.

Basically the product is a vitreous ceramic, rather than crystalline. The relatively rapid cooling from the melt provides the fibers with a smooth vitreous surface and long length and may account for their resilience. At the present stage of progress, the fiber is not available in spun, woven or filament form, although mixtures with other fibers permits carding and spinning. It should be noted that when fibrous glass was first introduced it was only available in bulk, so other forms of "Fiberfrax" fiber may eventually be commercially practicable.

Chemical data are still being evaluated, but Carborundum research tests indicate that the material's inert source and very low alkali content make it highly resistant to acid attack. Although work up to now has been concentrated on the high temperature possibilities of the material, "cold" applications exist where the fiber can compete with asbestos fibers and provide strength, light weight, thermal and electrical properties.

Insulation tests show that this fiber, as compared to high-quality refractory insulating brick, can make savings in weight and furnace efficiency. The savings are significant enough to make the material directly competitive even at the pilot-plant price of $1 a pound. Compared to high-quality cemented refractory insulating brick, tests show that thirty per cent less electrical power is required to maintain furnace equilibrium at 2500 F; time required to bring the furnace up to temperature is cut in half.

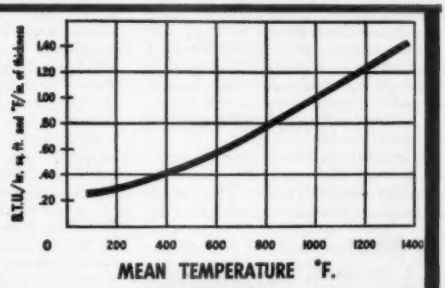
Readers interested in obtaining additional information on "Fiberfrax" may write The Editor, Plant Engineering, 110 S. Dearborn St., Chicago 3, Ill., or use the postpaid card elsewhere in this issue.

The Fiber and the Cigarette Test

To demonstrate the efficiency of the fiber as a filtering medium a bit of cotton was placed in a holder, then a bit of the new fiber was placed behind the cotton. When the cigarette was smoked, despite the filter in the cigarette, the cotton was stained, but the fiber in back of it was even more heavily stained. In a second cigarette, the cotton and the fiber were reversed in position. After smoking, the fiber was heavily stained but the cotton showed no stain. This simple test of the filtering efficiency of the fiber indicates many potential new uses for the material in filtering gases and liquids in the chemical processing fields. Filtering properties can be maintained when the fiber is processed into a fine paper; thus the new material is suitable for gas masks and similar replaceable filter applications.

	% LOSS IN WT. LEACHED 1 HOUR	
	Normal	*Concentrated*
• HYDROCHLORIC ACID	.34	.28
• SULPHURIC ACID	.31	.85
• PHOSPHORIC ACID	.28	.50
• NITRIC ACID	.25	.20
• ACETIC ACID	.16	.27

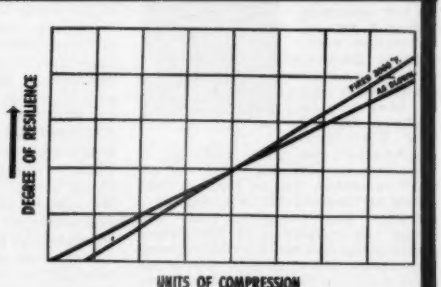
Solubility in various acids



Properties of furnace insulations

LINING	lb. cu. ft.	Hrs. to reach 2500°F	Average watts used to heat	Average watts required at equilibrium	Shell temperature °C	Lining wt. lbs.	Wall layer % ratio cemented brick=100
"FIBERFRAX" FIBER	6	3	7350	4168	210	372	69.8
"FIBERFRAX" FIBER	12	2¾	7677	3281	175	744	55.0
HIGH TEMPERATURE INSULATING BRICK-CEMENTED	44.2	6⅓	7820	5969	231	2710	100

Thermal conductivity at 6 lb per cu ft density



Resiliency of refractory fibers

Uniformity of lighting was wanted and achieved here. Note the absence of glare and shadow

Accent and display lighting illus-

Watch the Quality of Your Lighting—

PLANT OWNERS have in the past been particularly interested in making the best possible use of their daylight facilities. The sawtooth, monitor, or skylight windows of plant construction did permit a somewhat more uniform daylight illumination of the entire area. When rooms are illuminated through side windows alone, it is often difficult or impossible to satisfactorily light all parts of the floor area and furnish adequate illumination to the workers without subjecting some of them to objectionable glare.

To maintain good seeing conditions, artificial lighting must be supplied when daylight fails, as on dark and cloudy days or for the areas where an insufficient quantity of daylight penetrates and on other than daylight shifts. In some localities, deficient daylight conditions prevail during two-thirds of the working hours. Even in comparatively sunny territories, measurements show that desirable daylight conditions are lacking for a surprisingly large percentage of the time. For this reason, artificial lighting is essential to good plant operation even on "daylight" shifts.

With natural lighting, the space along the windows is, in most plants, the best lighted area, while with artificial lighting this space is too often the most poorly lighted. It is essential that the artificial lighting be so designed as to continue the general level of illumination close up to the windows and walls, thus insuring good lighting over the entire working area of the room, and to light the area adequately for night work.

Modern industrial lighting practice requires the establishment of a base or minimum quantity of light throughout the room, termed general lighting. This may vary depending upon the purpose for which the space is to be used. If the visual tasks are particularly severe, much higher illumination over restricted areas can be added upon this base. This additional light, known as supplementary lighting, is usually provided by luminaires placed relatively close to the areas being illuminated.

The general lighting system, in contrast, usually consists of luminaires placed 10 feet or more above the floor. The purpose of the general lighting system where there is also supplementary lighting is to keep the brightness contrast between the well-lighted immediate work area and the surroundings within a range which is comfortable to the eyes, to provide sufficient light for safety and protection, and to illuminate ordinary seeing tasks.

Uniformity

The general lighting, or the base quantity of light, should be quite uniform so that light will be available when needed at any point in the room. This is particularly desirable for interiors where the machine layout may be changed. If the general lighting has been designed for uniform illumination, machines may be moved without necessitating an expensive change in the overhead lighting system.

The manner in which the light from the lamp is controlled by the lighting equipment governs to a large extent the important effects of glare, shadows, distribution and diffusion.

Today many light sources may be used for our general lighting. These include fluorescent, filament and mercury lamps. Fluorescent lighting has gained in popularity since its introduction and today is the most preferred for low bay areas in which relatively close work is done. The low brightness of the fluorescent lamp has greatly improved the quality of lighting installations.

In high bays either straight mercury or combinations of mercury and filament lighting are being used.

The Author

W. J. Leemhuis was born in Floraville, Illinois, and received his elementary and high school education in Quincy, Illinois. He started working with the General Electric Company in Schenectady in 1927, on the five year Electrical Apprentice Course. Upon completion of the course he obtained a leave of absence to attend Kansas State College where he received his B.S. degree in Electrical Engineering in 1934. Following the completion of the general course he entered the Plant Equipment Engineering Office in 1936. He is the Plant Lighting Engineer, and has been and is actively engaged on plant power, electrical safety, standards, and special assignments.

trated in General Electric's commercial division display room. Quality achieved here, too

Things that affect lighting installations: Work that is to be done in the area; color and conditions of walls and work. Consider these for good seeing conditions in your plant

—It's Important!

By W. J. LEEMHUIS, Plant Engineering Div.
General Electric Company, Pittsfield, Mass.

The latter system is generally preferred since the color of light is more nearly that of daylight and in case of a power failure the filament lamps will immediately come back on when service is restored.

Supplementary lighting is necessary where the seeing task requires more light than can be economically or practically installed by the general lighting system.

Watch Contrast

Supplementary lighting should be specifically designed for the particular visual task. High illumination is usually provided with supplementary lighting, and care should be taken that the contrast between the bright work and darker surroundings is not too great. In some cases, the reverse must be guarded against—that is, having high brightness elsewhere in the field of vision.

Though no two sets of conditions are exactly alike, in general, the brightness ratio from maximum to minimum should not exceed 10 to 1; a ratio of 5 to 1 is preferable. While the measurement of footcandles is not an accurate determination of brightness, it suffices in most cases for this matter of satisfactory contrast; hence the common statement that with supplementary lighting the ratio of maximum to minimum footcandles should not exceed 10 to 1.

The quality of the lighting, whether natural or artificial, is highly important in providing good seeing conditions. Glare, diffusion, direction and distribution have significant effects on visibility and the ability to see easily, accurately and quickly.

Direct glare is a very common lighting bottleneck. Direct glare is simply too much light in the workman's eyes and too little in comparison on the work. The most desirable ratio between light in the eye and light on the work is 1 to 5 or greater. 1 to 2 can be tolerated, but if the ratio of light on the eyes to light on the work is 1 to 1 or worse, the condition must be corrected. Glare is to be found in almost every plant. It may be caused by lighting units that are too bright because the lamp size is too large for the reflector.

Glare may be due to bare lamps or poorly chosen reflectors which do not shield the lamps properly. In many cases it is due to small work lights (supplementary units) being turned to one side so that they do not provide proper shielding. The solution in most cases is relatively simple; namely, shielding the lamps properly and placing them so as to increase the light on the work and minimize light in the workman's eye.

Direct glare due to daylight is often experienced when workmen must face windows or a white wall which is directly lighted by sunlight during certain hours of the day. In this case the windows should be shaded by some form of shield designed to redirect the light either to the ceiling or downward to the work but in either case to minimize the amount of light toward the eye of the workman.

Reflected glare may be more objectionable than direct glare. Reflected glare, as its name implies, is caused by reflections of light sources, high brightnesses, etc., from ceilings, walls, desk tops, machines or other surfaces within the visual field. These brightnesses are accentuated when the surfaces are glossy or specular in character, such as highly-polished machine parts, smoothly-finished surfaces, var-

Lighting Standards

The Illuminating Engineering Society has been studying the illumination needs of specific industries in recent years. In establishing footcandle standards these studies have served as a foundation. These recommended standards are published in the A.S.A. "American Recommended Practice of Industrial Lighting."[1] These standards are given as minimum operating values. A generalization of this table can be made as follows:

Precision Work . . . Over 100 footcandles.

Severe and Prolonged Visual Tasks . . . 50 to 100 footcandles.

Critical and Prolonged Visual Tasks . . . 30 to 50 footcandles.

Moderately Critical Visual Tasks . . . 20 footcandles.

Casual Visual Tasks . . . 10 footcandles.

Rough Visual Tasks . . . 5 footcandles.

It would be suggested that the table be referred to for actual recommended footcandles for particular jobs.

[1] Copies of these standards are available for 25c from American Standards Association, 70 East 45th St., New York 17, N. Y.

nished table tops or other highly-reflective surfaces.

In many cases reflected glare can be minimized by changing the relative position of the light, the work, and the eye so as to redirect the reflections away from the eye. In other cases it is necessary to change the light source from a small, bright source to a larger, less bright source, providing the same amount of light on the work.

Confusing shadows, like glare, have no place in modern industrial lighting. Soft shadow effects are desirable to accentuate the depth and form of solid objects, but harsh shadows should be avoided.

Brightness contrast between the work and the surroundings is to be avoided. With alternate light and dark areas the eyes must frequently adapt themselves causing eye fatigue.

An efficient lighting installation is extremely dependent upon the often-neglected factor of maintenance. Systems which are adequate when first installed will soon deteriorate unless properly cleaned and relamped with occasional checks upon the voltage to be sure that there has been no reduction in voltage at the outlet.

Check the System

Good plant-housekeeping is a fundamental factor of safety engineering. This phase usually means having a place for everything and everything in its place, floors and machines thoroughly and frequently cleaned, and in general minimizing the possibility of accidents due to improper placement of materials. However, the plant engineer should also add one other item to his good plant-housekeeping duties. This is to check upon the lighting equipment and insist that an adequate maintenance program is kept in force.

A gradual accumulation of dust and dirt upon lamps and reflecting surfaces is often unnoticed because it usually deposits uniformly and thus cannot be seen by contrast with a clean surface. Workmen are not conscious of the decrease in illumination because of the low decremental rate. A good installation can depreciate to 50 per cent of its initial value, due mainly to the collection of dirt upon the lamps and reflecting surfaces, before it is realized that the lighting is not longer adequate.

The cost of cleaning lighting equipment is a very small proportion of the cost of operating the outlet. For this reason it can be cleaned frequently and thoroughly and still the cost of the light obtained on the working plane kept to a minimum. An adequate maintenance program should be set up so all lighting equipment is clean and delivering the lighting for which it was designed.

"Little" Fire Protection System at Saves Planes, Saves Space

By FRANK CLAYTON, Plant Engineer, Convair, Ft. Worth

DUE TO THE EXTREMELY large size of the B-36 intercontinental bomber and rather limited space for operations, particularly engine test runs and other preparations for flight, the Plant Engineering Department at Convair, Fort Worth Division had a special problem of providing fire protection, particularly against engine fires.

Normal protection of aircraft during engine run is to station fire trucks within easy access distance of each airplane or group so that in case an engine fire breaks out the truck can immediately run up close to the plane and quickly extinguish the fire. B-36 airplanes at Fort Worth, however, due to restricted areas had to be placed in a long line without sufficient clearance in front of the airplanes for operation of fire trucks. Also in order to provide suitable outdoor working facilities, steel frame, aluminum covered work docks were utilized. These further restrict access of fire trucks.

When planes are being prepared for engine run and other field operation tests they are pulled into the work docks where all engines and wing areas become readily accessible to the workmen. Then, when engines are to be tested, the planes

Fig. 1. A set-up such as this is provided at each plane station. It consists of eight 100-lb cylinders of CO_2 manifolded in pairs and connected to trip mechanism

Consolidated Vultee

Fig. 2. Tripping mechanism above the dock deck (this enclosed box is visible in Fig. 1). The banks of cylinders may be tripped either above or below deck

are pulled back approximately 40 ft clearing engines and propellers from the work dock structures.

Access from in front of the plane was restricted and stationing of fire trucks behind the planes was impractical due to propeller blast. Furthermore, due to the fact that a considerable number of planes may be operating engines simultaneously with only a limited number of fire trucks available, it was necessary to provide emergency fire fighting facilities which would hold and restrict an engine fire until a truck could reach the scene.

To solve the problem outlined above, each airplane station is provided with a set of eight 100 lb CO_2 cylinders on each side which are manifolded in pairs and provided with two long probe-type nozzles as well as a hose reel with standard nozzle. The banks of cylinders are shown in Fig. 1 and the tripping mechanism in Fig 2. Cylinders may be tripped from either below or above the main dock deck.

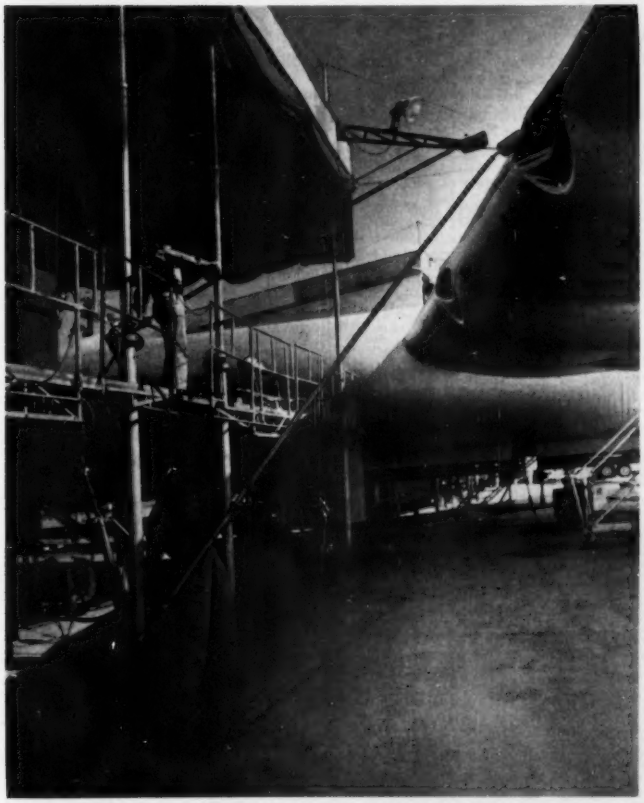


Fig. 3. Probes are generally applied to the air intake of the engines. These are on trailing edge of wing. Several fires have been stopped before becoming serious

As illustrated in Fig. 3, the probes are generally applied to the air intake of the engines which are mounted on the trailing edge of the wing. They may be quickly moved to any of the three reciprocating engines on each wing or to the outboard jet nacelle which can be reached from ground level.

The hose reel mounted under the dock and provided with a standard both bomb bay and nose and tail CO_2 nozzle gives ready access to cabins in case a fire should break out in those areas.

Proved Its Worth

Since installation of the fire fighting equipment on the work docks several nacelle fires have occurred during engine runs, any one of which could have developed into a general fire with the resultant loss of a $3,500,000.00 airplane and possibly spread to other planes on the flight line. However, with use of the equipment provided every fire has been contained within the engine nacelle itself until the fire trucks could arrive on the scene and completely extinguish the fire. In several cases of minor fires, the equipment has proved sufficient to completely extinguish them, and is considered an invaluable aid in solving a very serious problem.

PAINTING WITH FLOWERS

JUST NORTH OF THE main office entrance of the Fisher Body Plant on Verlinden Avenue on Lansing's west side is a floral design measuring 20 feet by 30 feet. The design is that of a Napoleonic coach, the trade mark used by General Motor's body-building division.

The emblem consists of 7400 individual plants of 4 different colors, grown especially during the winter in a nursery for this particular design. These plants are ordered about the first of November and are grown and cared for throughout the winter, to be delivered in the spring.

In the spring the bed is worked over in preparation for planting, and when the plants arrive, the design is stenciled with white silica sand to outline the pattern. Each individual plant is put in its proper place.

Considerable care must be taken in planting so that the outline will be true and correct when trimmed. Details such as the door handle, the passenger step and the eagles atop the coach must each be formed with precision.

The plants are carefully watered and cared for during the following 2 weeks, and then are trimmed by hand to perfect details, curves, etc. The watering and trimming must be carried on throughout the summer until fall frosts kill the plants, which remain in place until the following spring when the entire cycle is again duplicated.

Fisher Body employs regular gardeners to care for their lawns, roses, shrubs and flowers which are maintained in a manner that adds beauty to their location.

Over-all view of interior plant set-up at Ludman Corporation in Opa-Locka, Florida. Company manufactures doors, windows

How Plant Engineering and Design Cooperate to Cut Production Costs

Not just providing facilities, not just keeping them in condition, but also helping in re-design of the product, plant engineering at Ludman Corporation shows how the field is finding there are no barriers for the job it has to do

By GEORGE R. STOLTZ, Plant Manager, Ludman Corporation

George R. Stoltz, Plant Manager, Ludman Corporation, Opa-Locka, Fla., is the man responsible for the plant engineering and in general for maintaining the high efficiency of production in this growing plant

When the engineering department head was asked what problems had been encountered that had to be solved, the answer was that no problems had appeared. This was a tribute to the pre-planning and sound thinking that went into the development of facilities and production equipment.

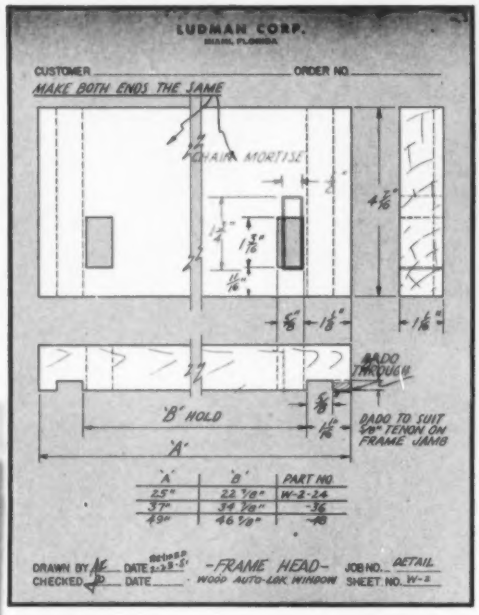
Prior to coming to Ludman Corporation two years ago George Stoltz was with the Miami Window Corporation, following a four-year tour in the army. Prior to that he had been with signal department of the Engineering Division of the Big Four Railroad in Cincinnati.

IF YOU HAD A PLANT that started manufacture of windows in July, 1949, and today found yourself the world's largest producer of awning type windows, I am sure you would agree that flexibility must have ruled the production line. It still does at Ludman Corp., Opa-Locka, Florida.

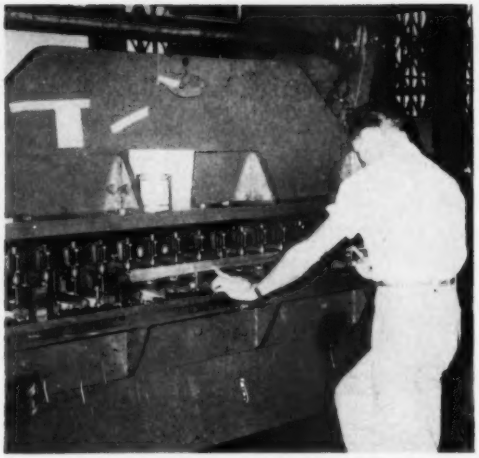
The 120,000 sq ft of floor space is inadequate to handle the growing demand for the aluminum awning type windows and production of glass jalousie doors and glass jalousies for porches. Now that the wood frame awning type window with aluminum hardware is being added, we are making use of every square foot of space available in the building.

One requirement for maintaining a growing production is the command of essential facilities. For this reason, we have developed one of the largest tool and die shops in the area and manufacture practically everything except the aluminum sheets and extrusions which are obtained from Arizona and Kentucky. All of the hardware parts for the windows are cut from sheets, shaped and manufactured in the plant. Two machines imported form Coventry, England, automatically turn out all the pins and rivets required not only for our company but also manufacture for several other companies. Our tool and die shop also produces to fill the needs of other manufacturers in the area.

In the setup of the plant the basic problem, flexibility rather than standard practice, ruled the layout. Most production layouts would place the operation of shearing sheets to strips somewhere between the warehouse and beginning of the production line. The fact that more special (rather than standard) sizes of windows and parts would be required, placed the basic shearing operation in the special window department under the foreman of that section. Much of the material



Blueprint at the right shows design changes which permitted use of a chain mortiser instead of a square mortiser bit; changes increased production efficiency by 1200 per cent



Pattern die is used here to pierce jalousie runner with 17 holes. Group die system not used here as in some operations

cut could be used in the special window section and that which had to be punched or shaped in other departments had a better chance of not becoming lost in the regular lines of production if kept separate. It was found furthermore, that if one had to load strips on a dolly at all for further manufacture, the time element of moving the dolly 10 ft was little different from moving it a hundred.

There are 4 other foremen who coordinate the work: two general foremen (one day, one night); a metal window foreman; a wood window foreman. One of the chief jobs of these foremen is to coordinate the flow of parts related to each specific order so that these related parts reach the assembly point together. In general, specifications for the windows in each building design vary. It is obvious that a simple production line can hardly be achieved: instead, there are several lines for producing parts, some of which cross each other. These lines are so laid out that variations in the parts can readily be made.

For example, at first glance it might seem that the same hardware used on the aluminum awning type window could be used on the new wood frame windows, but study showed that the properties of wood forced several changes in the aluminum hardware parts: wood members are thicker and require longer hinges, and to prevent possible splitting, the holes for the screws must be staggered, whereas the holes for the aluminum windows are punched in a straight line and the hardware could be narrower.

Plant engineering under such circumstances really rests upon the solution of numerous small problems and focusses attention upon finite subjects in plant operation.

Such a problem involved the methods of punching holes in aluminum or any other metal. One way uses a complete pattern die which cuts only one size piece. This requires a separate pattern for every different length or size made.

In punching a strip or runner for a jalousie, the complete pattern die is used because there is no variation between holes—no matter how long or high the jalousie may be.

In manufacturing the window, each change in height of window, or size of vent, requires a difference in the engineering to get the exact proper leverage in the closing and opening of the vents. If a complete pattern die were used, the number that might be required to fill all special orders could be unlimited.

We do make standard sizes (seven different lengths) but nearly all orders are special to fit various fenestration considerations. If we used complete die patterns for each specification, we might have to move the plant equipment out to store the dies.

To eliminate this multiplicity of patterns, Plant Management, in conjunction with Chief Engineer Frank Winget, standardized die patterns into groups.

A group die for the window consists of three holes. As many of these dies can be used as required, depending upon the height of the window or number of vents specified. A 2-hole punch required at top end can use the same 3-hole die. Only a single-hole die is needed to complete any pattern.

Spacing between 3-hole-group dies is variable—but if a 16-in. pitch is specified, all dies are centered 16 in. apart; if a 20-in. pitch is called for, all dies are centered 20 in. apart. Thus, any change in engineering requires no new dies, just a change in the spacing between group dies. Engineering, of course, takes this into consideration.

This method may not be as efficient as line production of a standard product using a complete pattern die, but the chief problem here is the flexibility without retooling or a wait for new dies—and that has been solved. The chief saving in this method is probably in reducing the number of pieces of equipment required to take care of peaks. Time for re-tooling, and die costs, are also saved.

Although this is but one item in the broad scope of plant engineering, it nevertheless illustrates what can be achieved when plant engineering and design engineering work in conjunction.

Another type of saving that can accrue through close cooperation between design and plant engineering is the adaptation of equipment and production technique by plant engineering to the design.

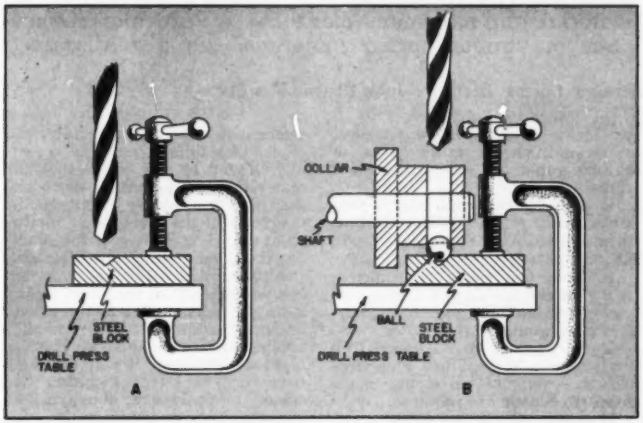
When the new wood windows with the aluminum hardware were first blue-printed, a number of minor changes were effected in that manner which greatly speeded production and ironed out operational

(Continued on page 157)

PLANgineering's "Top Two"

Improve Accuracy in Drilling and Measuring

First Prize Winner



A FREQUENT PROBLEM in the course of routine maintenance work is the replacement of a shaft in a piece of machinery. In many instances, with items such as pump impellers, sleeves, or thrust collars, the shaft is held in place by a pin driven through the collar and shaft.

To drill a replacement shaft to receive a pin, it is advisable to assemble the work, with the collar on the shaft, and drill through the existing holes in the collar.

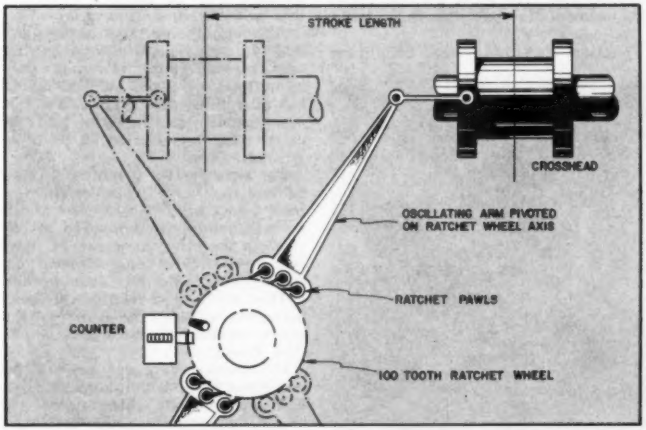
To center these holes in the collar under the drill, the use of the ingenious device pictured is a valuable aid.

The device functions by providing a fixed support point for the collar, that point centered under the drill. To accomplish this purpose, the procedure follows the two phases shown on the drawing:

A. Clamp a block of steel on the drill press table. Using a drill the size of the hole in the collar, spot an indentation in the steel block, deep enough to give drill clearance.

B. In this indentation, place a steel ball of slightly larger diameter than the hole, and place the work so that the hole in the shaft collar rests on the ball. The collar is thereby centered under the drill point, and the drill will follow a true line through the shaft, into the hole in the lower side of the collar.

Second Prize Winner



AS THE INITIAL STEP in determining flows in a boiler room not equipped with steam flow meters, the device pictured here was designed to measure accurately the flow of water through the boiler feed pumps.

Actuated by the pump strokes of the reciprocating, duplex plunger pumps, the ratchet wheel linkage was intended to minimize the errors resulting from variance in stroke length under fluctuating pressure conditions.

Instead of the usual practice of mechanically counting pump strokes, the reciprocating motion of the plunger is transformed into rotary motion of a centrally mounted ratchet wheel. Two oscillating arms, fitted with three pawls each, are operated by the pump plunger strokes, and in turn operate the ratchet wheel. The three pawls are so mounted that regardless of the length of stroke, one pawl engages a tooth in the wheel.

The flow through the pumps in a given time is measured by movement of the ratchet wheel. A counter, actuated by a projecting arm mounted on the circumference of the ratchet wheel, records the turns of the wheel. But, the ratchet wheel movement is a function of the length of each stroke, as well as the number of strokes, hence this relationship is far more accurate than that obtained by merely counting strokes.

September's PLANgineers

Gerald Leonardy, Machinist, Ainsworth Mfg. Co.
Myron Bixler, Plant Engineer, Dungan, Hood & Co.
James Burns, Yard Man, American Cyanamid Corp.
J. E. Nissley, Ch. Eng., Tobacco By-Products & Chem. Corp.

SPRINGS — Their Properties and Applications

Because there are many types and sizes of springs to choose from, it is important that you choose the right one to fit a particular need . . . Three factors should be kept in mind when purchasing springs: type of spring, the spring material, and maximum tolerance . . . Particular applications of various spring materials, are also discussed

By M. GERARD FANGEMANN, Manager Spring Division, John Chatillon & Sons

THE CHOICE OF the proper spring to fit your industrial needs is an important and difficult task. Initially, three factors should be kept in mind when purchasing springs, namely: the type of spring required, the best spring material suitable for efficient spring operation, and, for economic reasons, the maximum tolerances that can be permitted on physical and loading specifications.

The selection of the spring material that will be suitable for efficient spring operation will be dependent upon the conditions under which the spring will be expected to perform. The factors that must be taken into account are variations in temperature, resistance to corrosive materials, resistance to shock and fatigue, and the stress conditions under which the spring will operate.

If, for example, the spring is to be for a high stress application, material such as music wire or chrome vanadium steel will be best suited.

If the application is one of low stress and of infrequent loading, then hard-drawn spring steel will be satisfactory.

If, however, there is sufficient space for the application where corrosion resistance is required, stainless steel would be the choice.

If the springs are subjected to variations in temperature, then temperature-compensated springs made from Iso Elastic are required.

However, if the application requires springs operating at elevated temperatures, then special alloys such as Inconel and Inconel-X should be used. Factors like fatigue, creep and drift must also be taken into account when choosing spring materials.

After deciding the conditions under which the spring operates, the choice of a suitable material is usually limited to one or possibly two materials. Limitations of space and the part the spring plays in the operation of the machine or instrument also is a deciding factor affecting the choice of spring materials.

Although the alloy is important in the efficiency of operation of any spring, important also is the proper design of a spring for a particular application. In many cases because of restricted space it will be found necessary to select a spring designed to operate at much higher stresses than are ordinarily considered satisfactory from an engineer's point of view. In other cases the reverse may be true, and a spring, designed at very low stresses, may be efficient, assuming that sufficient space is available.

Although spring steel is the most widely used material for spring applications, there are not only many types of spring steel available but also other spring materials that are equally satisfactory, and in many cases superior for a particular application.

For example, for low stress applications such as adjustment springs, hard drawn steel spring wire would be satisfactory. Oil-tempered spring steel on the other hand can be used for medium stress applications where more uniformity over a range of time is required. Neither of these materials should be chosen for applications where springs have severe bends.

If, however, springs are to be subjected to extremely high stresses and severe bends, then music wire would be preferable. The main application for music wire springs would be where continuous loading and fatigue require it. Chrome-vanadium spring steel is used for extremely high stress applications where springs must be subjected also to extreme shock.

Special alloy steels are available also, such as type 302 stainless. This material will withstand corrosion, and although the cost of the material is higher than regular steels,

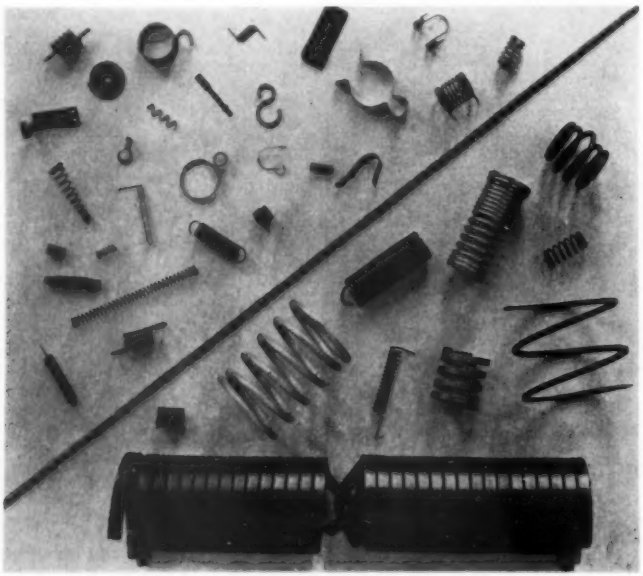


Table lists all main spring steels, special alloys, and spring properties that will be useful in selecting the proper material

SPRING MATERIAL	Elastic Limit Per Cent of Tensile Strength		Modulus of Elasticity	Modulus of Rigidity	APPLICATIONS
	Tension	Torsion	Psi	Psi	
Hard drawn—SAE-1360	70	50	29 x 10^6	11.4 x 10^6	Low stress applications; bed springs, toys, etc.
Oil tempered—SAE-1065	85	45	29 x 10^6	11.2 x 10^6	Medium stress conditions; scales, general use, etc.
Music wire—SAE-1085	60	45	30 x 10^6	12 x 10^6	High stress applications, such as pressure plates, switches, mech. applications
Chrome-vanadium—SAE-6150	90	55	30 x 10^6	11.2 x 10^6	Extreme stress conditions; shock loading, valves
Silicon chrome	85	55	30 x 10^6	11.5 x 10^6	Extreme shock conditions; guns (recoil), etc.
Blue tempered—SAE-1095	90	45	30 x 10^6	11.5 x 10^6	High stress applications; clock & motor springs
Stainless (18-8)—SAE-30915	70	40	26.5 x 10^6	10 x 10^6	For corrosive resistance applications; valves, etc.
Inconel	75	45	26 x 10^6	10.5 x 10^6	Non-magnetic, withstands 700 F; for engines & corrosive resistance applications
Inconel X	75	45	31 x 10^6	11 x 10^6	Non-magnetic, withstands 1200 F; for high temperature applications
Phosphor bronze—SAE-81	75	50	14.5 x 10^6	6 x 10^6	Non-magnetic, for electrical applications, contacts, switches
Brass—SAE-80	50	45	14.5 x 10^6	5 x 10^6	Electrical applications; switches, etc., for temperatures less than 120 F
Beryllium copper	75	50	17.9 x 10^6	7.25 x 10^6	Electrical applications; non-magnetic, for switches, fuse clips, etc.
Iso Elastic	60	35	26 x 10^6	9.2 x 10^6	Temperature compensated; excellent drift & hysteresis, for precision scales and instruments

the over-all cost of the spring may be less in many cases since plating will not be required.

Phosphor bronze is an alloy of tin, lead, copper and zinc. It is very commonly used for spring applications in the electrical field. It has good conductivity and resistance to corrosion, but it has the disadvantage that it cannot be used above 120 F or in salt water areas.

Beryllium copper is being used more extensively at this time, since it combines high strength with good electrical conductivity, and is non-rusting and non-magnetic at the same time.

For specialized applications of accurate force measuring devices, it is usually necessary to make use of a temperature compensated material called Iso Elastic. Iso Elastic has a low temperature coefficient of the modulus of elasticity, and is very well adaptable for precision instruments, since drift error is less than 0.02 per cent and hysteresis error is less than 0.01 per cent of the total spring deflection. Iso Elastic receives most of its spring properties by means of cold working, and is not a heat-treatable alloy.

Inconel and Inconel X are alloys that contain very high quantities of nickel, and offer good corrosion resistance to corrosive materials. Inconel is applicable for temperatures up to 700 F, and Inconel X can be used as high as 1,200 F.

Table shows the minimum tensile strength of various sizes of spring materials

SIZE	Music Wire	Hard Drawn*	Oil Temp.*	Stainless 18-8	Temp. Alloy	Phosphor Bronze	Spring Brass
	In thousands of pounds per sq in.						
.004	439						
.008	399					140	125
.012	377			316			
.020	350		288	300			
.028	333		281	284			
.032	327	265	275	278	281		
.035	322	261	268	274	276		
.041	314	255	261	270	270	135	120
.047	307	248	254	262	263		
.054	301	243	248	258	257		
.063	293	237	242	251	251	130	115
.072	287	232	236	245	245		
.080	282	227	230	240	240		
.092	275	220	225	233	235		
.105	269	216	220	227	229	125	110
.120	263	210	215	221	222		
.135	258	206	210	213	219		
.148	253	203	205	207	215		
.162		200	200	200	212		
.177		195	195	195	210		
.192		192	190	189	206		
.207		190	185	185	204		
.225		186	183	180	200	120	100
.250		182	180	174	196		
.312		174	178	160	189	110	90
.375		167	175		187		
.437		165	170		186		
.500		156	165		185	100	85

Tensile strengths shown for phosphor bronze and brass are approximate values

*Medium carbon basic steel 0.55 to 0.70 carbon

From *Standards for Mechanical Springs* by Spring Manufacturers Association

REFRIGERATING SYSTEMS— Their Operation and Maintenance

Part I—Introductory presentation of the compression, absorption and ammonia-compression systems of refrigeration . . . Plus a discussion of the various types of refrigerants . . . With suggestions for detecting refrigerant leaks

SEVERAL TYPES of systems are employed in industrial refrigeration. Most important among these are the compression, absorption, and booster-compression systems. This article presents a general review of each of the systems. Subsequent articles will go into a more extensive discussion of the operation and maintenance features of each.

Compression System

In the compression system, Fig. 1, a complete refrigerant cycle is as follows:

Liquid refrigerant is fed into the evaporator through a control valve in sufficient quantity to meet the requirements of the refrigeration load. The refrigerant feed may be either automatic or manual.

As the compressor pumps refrigerant gas from the evaporator, the pressure is lowered on the surface of the liquid refrigerant within, causing it to vaporize and absorb large quantities of heat from the air or liquid in contact with the evaporator surface.

In the compressor, the refrigerant gas is compressed to a pressure sufficient to raise its temperature above that of the condenser cooling air or water; hence, in passing through the condenser, the absorbed latent heat is removed from the gas, and it changes to liquid form and drains into the receiver.

From the receiver the liquid refrigerant again is fed into the evaporator as needed, completing cycle.

Refrigerant gas entering the compressor is called suction gas; that leaving the compessor, discharge gas. Gages at these locations indicate the suction and discharge pressures respectively.

The centrifugal system of refrigeration is essentially the same as the compression system, except that a two- or three-stage centrifugal compressor is employed.

Absorption System

The absorption system, Fig. 2, operates on the principle of absorption of ammonia gas by water. The refrigerant, called aqua ammonia, is a solution of ammonia in water. The only mechanical equipment used in this system is an ammonia pump.

The cycles of operation of absorption refrigeration are as follows: The generator and absorber are filled to the proper level with aqua ammonia. This is called strong liquid. Cooling water circulates through the condenser, absorber and weak liquid cooler.

The ammonia pump draws strong liquid from the absorber and pumps it through the rectifier and exchanger into the generator. Here the strong liquid is heated, thus releasing the absorbed ammonia gas and leaving what is called weak liquid.

The heating of the ammonia in the generator raises the pressure in the generator, rectifier and condenser to the point at which the gas will condense in the water cooled condenser. Thus the working pressure of the condenser is determined by the condensing temperature of the ammonia gas. The lower the cooling water temperature the lower will be the condenser pressure.

As the ammonia gas leaves the generator and passes through the rectifier it comes in contact with tubes through which the strong liquid passes. Since the gas temperature is higher than that of the strong liquid, the strong liquid is heated and moisture in the gas is condensed. This moisture is reremoved by a separator and returned to the generator by gravity, while the comparatively dry gas passes to the condenser, where it condenses and drains into the anhydrous liquid receiver.

From the receiver the liquid ammonia passes through the expansion valve into the evaporator. The low pressure in the evaporator (25 lb or less) causes the liquid ammonia to vaporize and absorb heat from the air or liquid in contact with the evaporator surface. This heat-laden gas then passes to the absorber.

In the meantime, the weak liquid passes from the generator into the exchanger, where some of its heat is absorbed by the strong liquid on its way to the generator. This partially cools the weak liquid and warms the strong liquid, thus permitting economy in the heat requirements of the generator.

The weak liquid passes from the

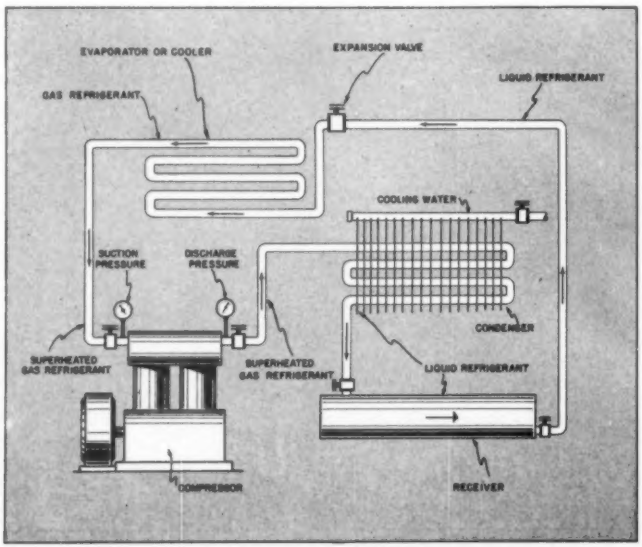
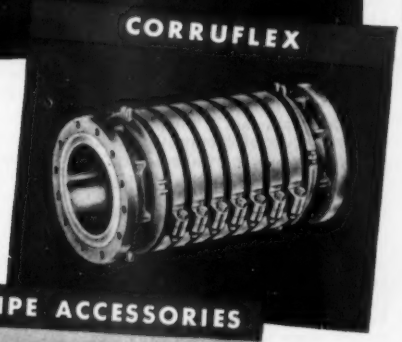
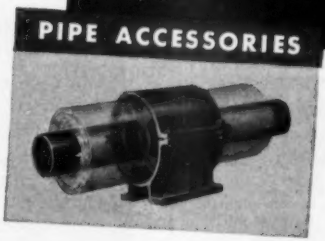


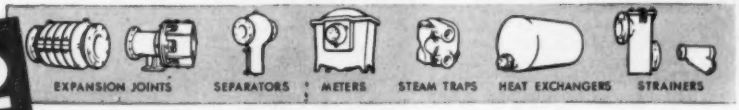
Fig. 1. In the compression system, refrigerant gas is compressed to high pressure, cooled in condenser, passed to receiver, then expansion coils where it evaporates

ADSCO EXPANSION JOINTS





ADSCO'S piston-ring expansion joints can be serviced *and* packed under full-line pressure. That's why they're best. Simple and compact, they will absorb expansion caused by temperature differential in pipes carrying liquids, gases, or steam. The high-polish surfaces of these joints can never be scored, because the slips are in contact only with packing. Misalignment is prevented by both internal and external guiding. Write for Bulletin 35-15G. Remember, only ADSCO makes all types of expansion joints. We don't have to sell what you don't want to buy.



ADSCO
75 YEARS OF LEADERSHIP

AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK

exchanger to the weak liquid cooler, where it is further cooled, and then into the absorber, through a liquid level regulator. Here the weak liquid reabsorbs the ammonia gas from the evaporator, forming again the strong liquid in the absorber. This completes the double cycle of circulation.

Cooling water circulating through the absorber removes the heat of absorption of the ammonia gas by the weak liquid.

Booster-Compression

In ammonia-compression systems, it is sometimes necessary to employ a separate booster compressor, in order to economically provide low temperature cooling, or provide for the cooling of two or more loads having temperature differences of at least 20 F.

Figure 3 shows the refrigerant cycle of such a system. The booster compressor draws refrigerant gas from the low temperature evaporator and discharges it into the water-cooled inter-cooler at 25 lb pressure and 130 F temperature. Here the gas is cooled to about 95 F, after which it passes into the liquid and gas precooler.

In the precooler, this gas bubbles up through liquid ammonia, maintained at a fixed level by float control, and is thus cooled to the saturation temperature corresponding to 24 lb pressure, or 11.3 F, before passing though the expansion valve.

The high pressure compressor draws the booster compressor discharge gas from the precooler, together with the gas vaporized from the liquid ammonia in the precooler, in the process of cooling the liquid ammonia in the precooler coil and in cooling the booster compressor discharge gas. In addition, it draws the refrigerant gas from the high temperature evaporator, if any, and discharges it at normal condensing pressure to the water-cooled condenser, where it condenses to liquid form and drains to the receiver. From the receiver the liquid ammonia passes through the expansion valve of the high temperature evaporator, if any, and the precooler coil and float control, thus completing the refrigerating cycle.

Type of Refrigerants

Refrigerants employed in commercial refrigeration include ammonia, Freon, methyl chloride and Carrene No. 2.

Ammonia has a latent heat of evaporation of 565 Btu at 5 F, permitting it to absorb large quantities of heat per given volume. However, it is very toxic, and is combustible or explosive when mixed with approximately two parts air, and much more so when mixed with oxygen.

Small ammonia leaks may be detected by burning a sulphur taper, which emits thick white smoke in the presence of ammonia. Phenol-

(Continued on page 154)

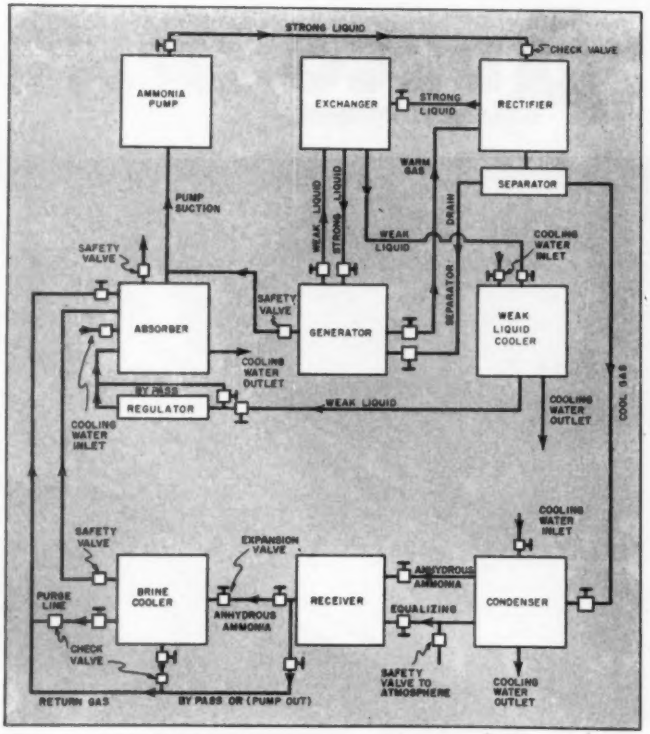
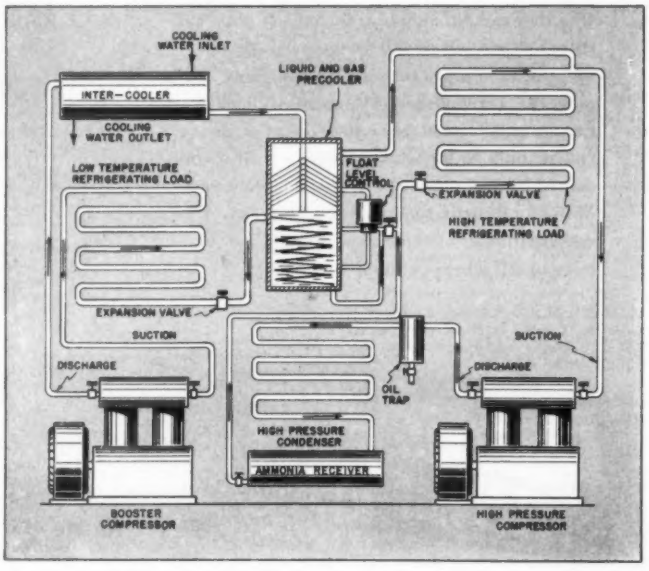
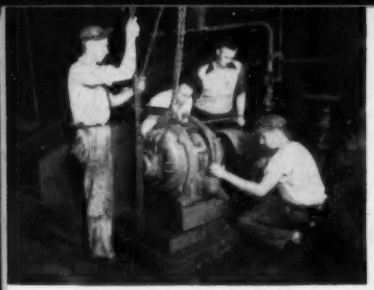


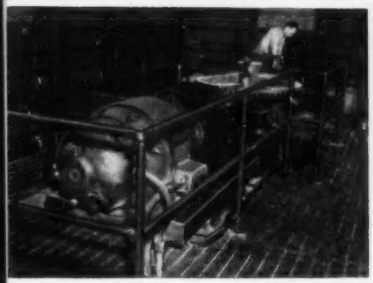
Fig. 2. Principle of this system is the absorption of ammonia gas by water. The refrigerant used, called aqua ammonia, is a solution of ammonia in water

Fig. 3. A separate booster compressor is sometimes necessary to provide low temperature cooling, or cooling for two or more loads having temperature differences of at least 20 F. Diagram below shows cycle of ammonia-compression system

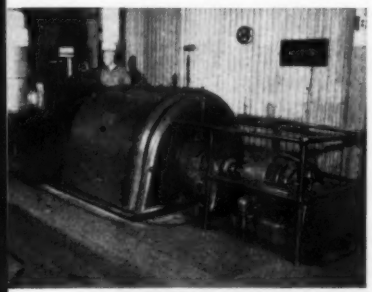




Servicing of standby pump motor is checked by Paul Tuttle (2nd from left), of G.E.'s Cleveland Apparatus Service Shop.



Standby motor for this circulator motor on 4-story-high vacuum pan is always ready to protect its nonstop 10-day cycle.



Renewal parts for main turbine-generator are ordered in advance for its annual overhaul, when 3 standby units take over.

Management recognizes maintenance as a vital factor in obtaining higher production at the Colonial Salt plant in Akron. E. Edminister (left), maintenance supervisor, is ranked at same level as two production supervisors, all three reporting directly to George Martin (right), superintendent of plant operations.

Get more management recognition with *Productive Maintenance*

New G-E program helps maintenance men prove it can increase output

The Colonial Salt Division of General Foods has long known the importance of maintenance in raising output. As a result, in its Akron plant, maintenance ranks on a par with production. Now, to help you sell *your* management the same point of view, General Electric offers a new *Productive* Maintenance program that emphasizes planned equipment overhauls to minimize breakdowns. With a helpful "kit of tools," you can prove to your management that *Productive* Maintenance can increase output in *your* plant. Ask your G-E Apparatus Service Shop representative for full details, and write for your free kit to *General Electric Company, Section 801-6, Schenectady 5, N. Y.*

An adequate supply of needed renewal parts for emergency is kept in plant's stockroom and replenished whenever necessary.

Motor-record cards—part of plant's equipment-record system—help keep track of these reconditioned motors, ready to replace others on a scheduled maintenance basis.

New G-E "Kit of Tools" helps win management support. Write to *General Electric Company, Section 801-6, Schenectady 5, N. Y.*

GENERAL ELECTRIC

For Boiler Efficiency Auxiliary Equipment Is Important, Too

Auxiliary equipment is discussed for: . . . A low pressure heating plant with condensate return . . . Low pressure heating and processing unit where process steam is required . . . Medium pressure heating and processing unit . . . And, a process steam plant operating above 70 psi

By **WILLIAM W. GAYLORD**, Consulting Engineer

BOILER AUXILIARIES, even in the small heating plant, should be given as careful consideration as the main units, as the success or failure of the heating plant often depends on their operation. Of course the number and type of auxiliaries required varies from those needed for the low pressure plant for building heating to the plant supplying large quantities of high pressure steam along with steam for building heating; so it will be necessary to consider them under several headings.

Some auxiliaries, usually referred to as boiler trimmings, are required by the boiler code and must be installed on all boilers. These include a steam pressure gauge, a water column with gauge glass and try-cocks, one or more pop safety valves and one or more blow-off or drain valves. These trimmings are usually furnished with the boiler and are either assembled on boiler or come separate to be installed with boiler.

Condensate Return

The first is the low pressure heating plant where all condensate is returned to the boiler. Here the only auxiliary in addition to trimmings absolutely required is some form of condensate pump or alternating trap to insure the prompt return of condensate boiler. In oil or gas fired units the boiler will be protected against low water by the low water cutoff which comes as a part of the burner equipment, but in the coal-fired units it is advisable to install some form of automatic water feeder which will supply city water direct to boiler in case boiler water level drops below safe limit.

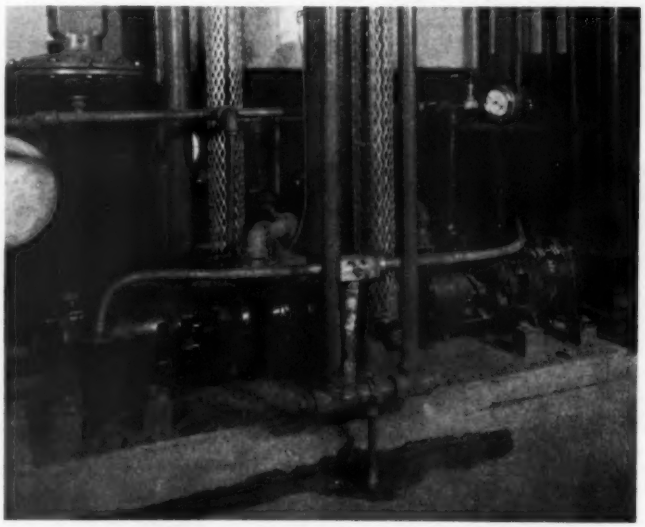
Because either the condensate pump receiver or the alternating trap is vented to the atmosphere there is usually little, if any, trouble from oxygen corrosion, but many plants have found serious trouble from return line corrosion due to CO_2 dissolved in the condensate. To protect against this it is very desirable to provide some means of feeding an inhibitor, usually of the amine-type, to the condensate returned to the boiler.

Process Steam

The second is low pressure heating and process steam plant where considerable process steam is required the year around. If the condensate from all the process steam can be returned to the boiler the same auxiliaries as for the heating plant above may be used but in many cases a part, if not all, of the condensate from the process steam must be wasted because of contamination.

If condensate must be wasted so that considerable make-up water is required, it is generally a better practice to have the operation of the condensate pump controlled by the water level in the boiler rather than by a float in the condensation pump receiver and to depend on the automatic boiler feeder to supply the make-up. To do this requires some form of pump control to be piped into the boiler water column. This can be a float-operated device that actuates a switch to start and stop pump or of the electrode type where the boiler water level itself makes the circuit through the relay that operates the switch. There is a number of both types available that give dependable operation. The make-up water would then be supplied to the receiver on the condensation pump through a float controlled valve.

Where considerable make-up water is required it is usually necessary to use some type of boiler water treatment to keep the boiler free from scale and sludge. This



The condensate return pump is just one of the many boiler accessories which should be considered as a design preliminary for efficient operation of boilers

A century of achievement

Studebaker's big, modern South Bend plant symbolizes the century of growth and achievement which have earned for this company an enviable reputation for high quality products and world-wide recognition as America's fourth largest manufacturer of automobiles.

How Standard's lubrication service works for Studebaker

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In one of the many operating departments, the chances are you'll find the Standard lubrication specialist who serves Studebaker. He is assigned to the South Bend area and is close-at-hand to give Studebaker the lubrication engineering assistance they need when they need it.

Almost any day at Studebaker's, you'll see a Standard tank wagon or truck delivering the petroleum products that help keep production rolling. Because these deliveries are made from a nearby Standard warehouse, they are prompt and reliable. Most of the petroleum products used in the Studebaker plant are stocked in this warehouse and are immediately available.

All along Studebaker's assembly and production lines, you'll find Standard Oil products at work. From one of the most complete lines of fuels and lubricants on the market, Studebaker has been able to select the petroleum products that exactly fit its needs.

All of these benefits—expert engineering service, fast and reliable deliveries, a complete line of high quality products—add up to one of the reasons why Studebaker has been a Standard Oil customer for over 50 years. Make Studebaker's experience the basis for putting Standard's lubrication service to work for you. Just phone your local Standard Oil (Ind.) office and ask to have the Standard Oil lubrication specialist in your area call on you.

What's YOUR problem?

Russ Jenkins (left), lubrication specialist from Standard's South Bend office, and Studebaker's Paul Izdepski work closely together to get best results from Standard's fuels and lubricants.

Wherever your plant is situated in the Midwest, there is a Standard lubrication specialist close-at-hand who will work hand-in-hand with you on lubrication problems. Right in your neighborhood, too, you'll find a Standard office and warehouse. It makes immediately available to you a reliable supply of petroleum products. Phone your local Standard office soon, and find how you can profit through Standard's unique industrial lubrication service.

STANOBAR Grease is used throughout the Studebaker plant for lubrication of bearings in electric motors and oil pumps. Its high stability enables it to provide effective lubrication under a wide variety of operating conditions.

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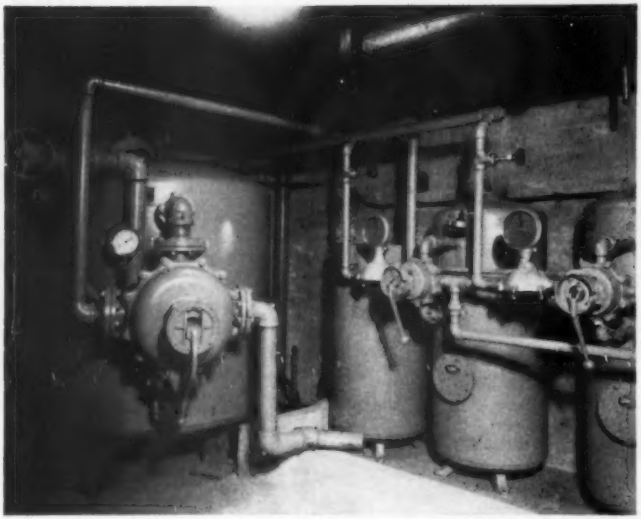
STANDARD OIL COMPANY STANDARD (*Indiana*)



Treatment of boiler water is important for good operation. Proper provision should be made for feeding, treating, sampling and testing of the boiler water

treatment should be fed into the feed pipe between pump and boiler and one of the pot type or equivalent boiler compound feeders should be installed to do this.

Medium Pressure Unit

The third is the medium pressure (30 to 70 psi) heating and processing plant. Under these conditions two independent methods of feeding boiler are required by insurance and state or city codes so that more auxiliaries are required.

In most cases an injector or a direct connection to the city water lines, if pressure in city water mains never goes below maximum boiler pressure, will be satisfactory for the auxiliary feed.

For the main boiler feed and condensate return one of the commercial boiler return feed pump systems will be advisable. These consist of a motor-driven pump with its suction connected to a receiving tank mounted on a common base and ready to be installed as a unit. The receiver is usually equipped with same type of float-controlled make-up valve and has openings provided to receive low pressure condensate and high pressure trap discharge connections. The pump should be of the multi-vane turbine type as this will handle water at or near the boiling point without requiring the receiver to be raised so as to provide a high positive head on the pump suction.

Operation of the feed pump should be controlled by a boiler water level controller as described above under the low pressure process plant. If two boilers are to be operated simultaneously, two pumps, each taking its suction from the receiving tank, can be installed and each pump operated from the control on the boiler it is to feed.

Where the make-up represents a considerable percentage of the total boiler feed and there are not enough high pressure trap returns to keep the water in the receiving tank at or near the boiling point, one of the various deaerating systems, using live steam, should be installed to do this. If this is not done the use of a variable capacity motor-driven pump to feed boiler water treatment and oxygen inhibitor to the boiler continuously should be considered. With continuous feeding of treatment a continuous blow-down using a variable orifice or flow control valve would be desirable.

Steam Plant Above 70 psi

The fourth condition to be considered is that of a process steam plant designed to operate at above 70 psi with the steam for building heating supplied through reducing valves. This will, in general, require the same type of auxiliaries as the medium pressure process plant described above.

However, if there is much process equipment operating at pressures of 70 psi or above, some provision must be made to reclaim the heat that would be lost as flash steam if the condensate from this equipment was discharged into the condensate return mains connected to vented receiver on feed pump. One way to do this is to return the condensate from this equipment to the boiler under pressure by using a special high pressure condensation return pump.

Another method that has proven satisfactory in many cases is to pass the condensate from this process equipment through a heat exchanger to heat the feed water between the feed pump and boiler. One of the special deaerator type heat reclaim systems would be most satisfactory for this purpose but as no two process plants are exactly alike the details of the system should be worked out to suit each plant.

The above feed and condensate return systems are designed to be fully automatic, thus requiring considerable automatic control equipment which makes them quite expensive to install but this is justified if no operator is to be kept in the boiler room at all times.

If an attendant is to be kept in the boiler room at all times, it is often possible to work out a system using a standard type deaerating feed water heater and direct acting steam-operated feed pumps that require little, if any, automatic control equipment which will give quite satisfactory operation.

In these higher pressure plants the installation of duplicate feed pumps, either of which will feed the boiler, is more satisfactory than depending on an injector to feed the boiler in case of a feed pump failure.

Treatment of Boiler Water

In these higher pressure units the proper treatment of the boiler water is more important than in the low pressure units and proper provision should be made for feeding, treating, sampling and testing the boiler water. Where the percentage of make-up is small the pot type intermittent feeder is usually satisfactory; but if the percentage of the make-up is large, both continuous feeding of treatment and continuous blow-down are advisable especially in units producing 5,000 or more pounds of steam per hour.

The equipment for continuous feeding of treatment should consist of a tank, of sufficient capacity to hold a day's batch of treatment, from which an adjustable capacity motor-driven pump delivers the treatment directly into the boiler drum. There are several makes of pumps which are especially designed for this service. There are also continuous blow-down controls using varying sized orifices or precision flow control valves available. To make these most effective the boiler water should be tested daily and the treatment feed and blow-down adjusted to maintain correct conditions. There are test kits available for this purpose by which these tests can be made very simply by the boiler operator and require only a few minutes per day.

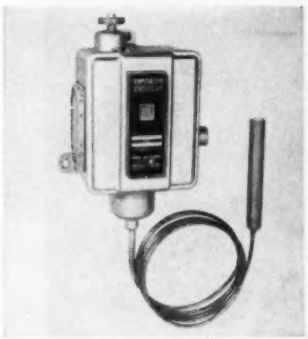
Because the operation of auxiliary equipment in boiler plants is largely automatic, sufficient attention to this equipment is usually overlooked. A periodic check should be made to see that the equipment is functioning properly.

DAVID CRAMPTON, OF WALLACE AND TIERNAN, SUBMITS WINNING IDEA

Mr. David Crampton, of Wallace and Tiernan, Belleville, New Jersey, describes a super-safe system for controlling a continuous drier used to process a material extremely sensitive to high heat. For his report, Mr. Crampton won an award in the Honeywell Industrial Control Idea Derby.

Air is heated by a steam coil, then forced by a blower into the continuous belt drier. Air temperature is regulated by a controller whose bulb is located in the air stream coming from the blower. This controller operates a *Modutrol* proportioning valve in the steam line. A second Honeywell controller, set at a temperature five degrees above the first, shuts off a solenoid valve in the steam line if temperature rises too high.

To insure against failure of the first two controllers, a third instrument set ten degrees above the first closes a damper shutting off air to the drier, and turns off the blower motor. As a final precaution, a fourth controller operates at a point twenty degrees higher than the first one to ring an alarm and trip a valve that deluges water over the material on the drier belt.



Non-Indicating Temperature Controller

NEW NEWSPAPER HELPS PLANT ENGINEERS

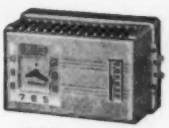
Honeywell's Industrial Division now issues a periodic publication—*Industrial Control News*—which contains detailed information on many new and unusual applications for automatic controls throughout industry. In its pages, production and maintenance men tell how they are reducing costs and increasing operating efficiency on all types of equipment. According to a release from the company, anyone interested in industrial controls can contribute to *Industrial Control News* . . . and can receive copies . . . by sending name, company, title and address to MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Station 40, 4491 Wayne Ave., Philadelphia 44, Penna.

do you have an "IDEA" for the

Honeywell Industrial Control

IDEA DERBY?

Just send us a sketch and description of how a non-indicating control is now being used to help keep things running smoothly in your plant. Think about it! Then send it in! An impartial board of judges will rate it in terms of its importance to the maintenance of plant operations. You may win a Honeywell Electric Clock Thermostat or one of the other special awards. All material submitted becomes the property of MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* 4491 Wayne Ave., Philadelphia 44, Pa.



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MINNEAPOLIS
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First in Controls

Production Jumped, Costs Cut
With Tube and Rod Straighteners

THE INSTALLATION of one machine in the Pawtucket, R. I. factory of The Mackenzie Walton Co. enabled this non-ferrous seamless tubing redraw firm to secure many new customers during 1951.

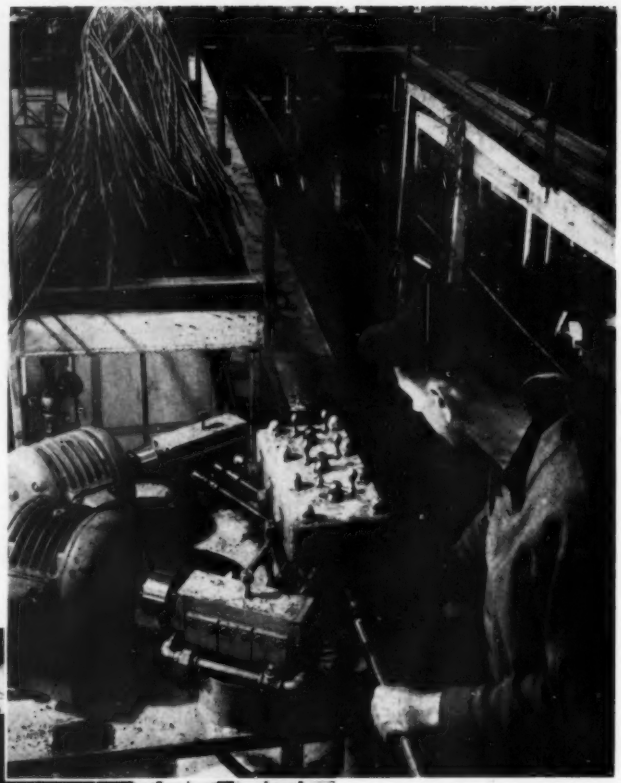
The rotary straightener, shown at the right, works to such close tolerances that the firm has been able to meet its customers' most exacting specifications, including some never before attempted.

Most of the tubing passing between the six power-driven cross rolls in the machine has been of 70-30 high brass and of from 0.175 to .500 in OD. Typical of current work accomplished is the meeting of a 0.005 in. per ft straightness tolerance on tube which is 0.400 in. OD., by 0.007 in. wall, 80,000-85,000 psi.

Another popular size is 0.298 in. OD. by 0.282 in. ID. The rotary straightener works on 12 ft lengths and meets a specification of 1/32 in. deviation in 144 in. This tube, straightened at the machine's rated output speed of 120 fpm, has a tensile strength of more than 72,000 psi.

Sample lengths of straightened high brass tube are then given an internal stress, mercurous nitrate test.

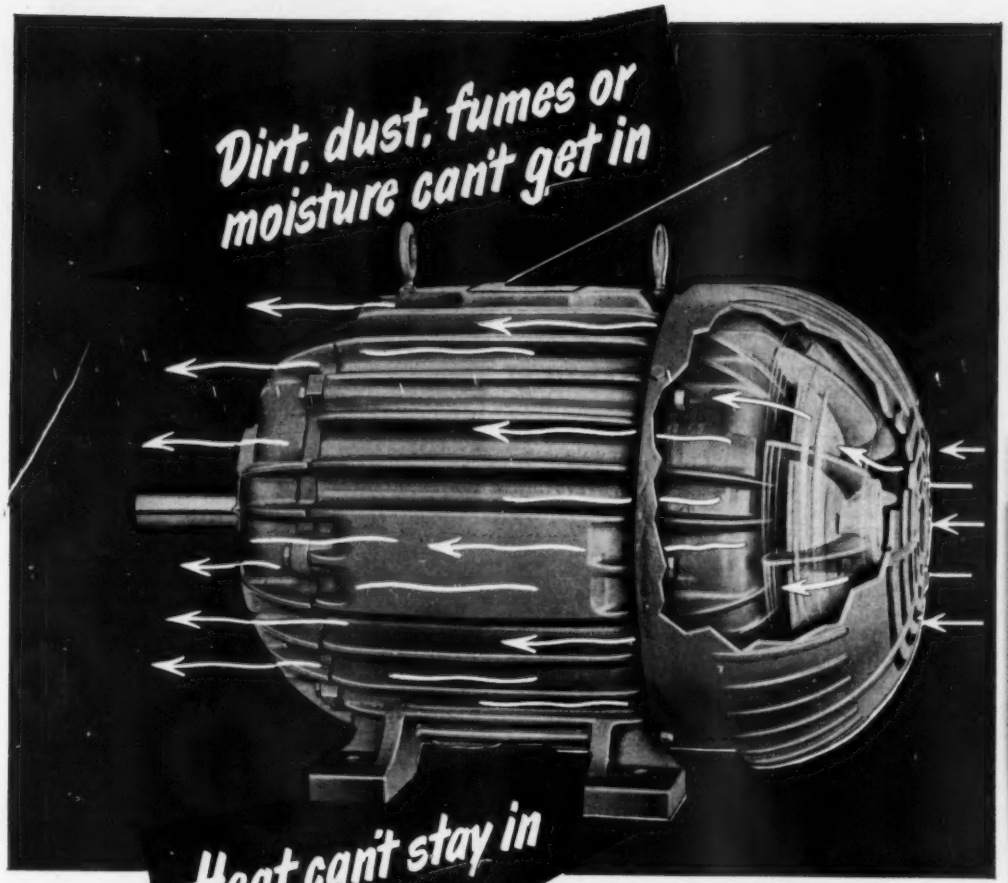
All tubing finished is closely controlled as to metallurgy, physical dimensions, properties and appearance.



ABOUT A YEAR AGO, a problem in straightening steel tubing faced the Summerill Tubing Co. Production difficulties were constant in straightening certain small sizes of tube such as alloy steel tubing with 0.250 in OD.

A new rotary straightener was installed early in 1951 for the specific task of handling steel tube ranging in OD. from 0.156 to 0.437 in., at a production speed of 120 fpm.

This machine at the left is now credited with eliminating former production problems. One man, instead of two, now works on 10 to 25 ft lengths of this tube and with the full roll contact secures straightness and finish end to end, better than required by commercial tolerances.



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■ Here's a motor that doesn't care how tough the conditions are. Blizzards of dust or grit can't affect it—not only can't get *in*, but can't even stay *on* the outer case. The powerful fan-driven, cowl-directed air blast sweeps it off, and also drives off the heat radiated from the many fins.

Easy to see why this Sealedpower motor has for **eleven years** been the ace-in-the-hole among engineers who are confronted with drive conditions that would defeat ordinary motors.

Thousands now in service, and going strong in oil refineries, lumber mills, chemical and textile plants, outdoor and indoor installations everywhere. 3 to 125 hp. Also as explosion-proof underwriters approved in most ratings. Get the facts. Address Elliott Company, Jeannette, Pa., or your nearest Elliott district office.

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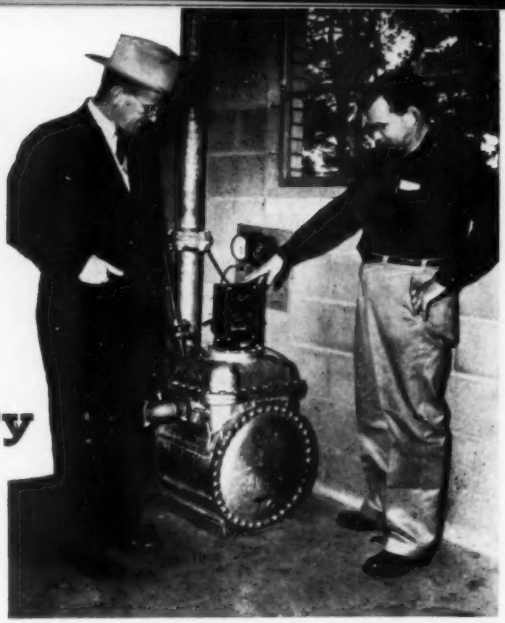
W2-8

OXYGEN Gets Its Own Pipeline to Industry



This meter measures the flow through the world's first commercial pipeline handling pure-dry oxygen gas for industry

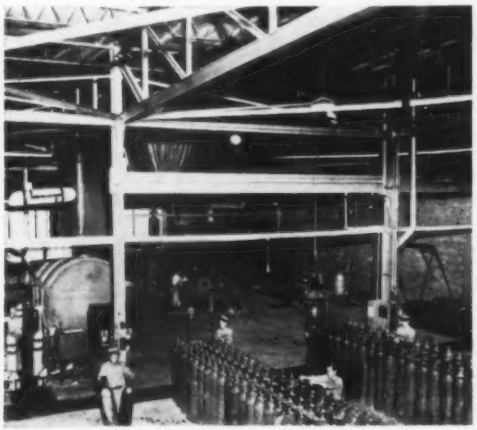
FROM A NEW PLANT in the western section of Houston, Texas, runs the world's first pipeline to supply industrial consumers with pure oxygen.

This important development is one feature of the Houston Oxygen Company's plant for the production of oxygen and nitrogen in both liquid and gaseous form, and of gaseous argon. Starting with the most basic of raw materials—air—the plant produces finished products vital to a large number of industries, including petroleum, steel, chemicals, shipbuilding and aviation.

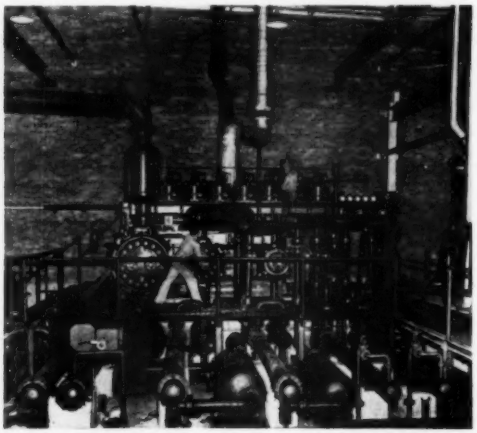
In a process described by the plant's engineers as "very simple—primarily involving the processes of compression, expansion, condensation, distillation and evaporation," air is filtered and taken from the atmosphere by the first stage of a five-stage compressor battery. Here it is compressed to 30 psi, and sent to dual scrubber towers for cleaning, and successively through the compressor stages to the fifth, which compresses it to 2350 psi.

At this pressure, it enters the cold dryer, which freezes off the moisture present in the air, under a temperature of -35 deg. Next, through a series of heat exchanges, expansions, (one of which is done in an expansion engine, used to run a 44 kw generator for plant power) and distillations, the air is liquified and the components are separated as crude liquid oxygen and crude liquid nitrogen. Further distillation produces pure liquid and gaseous products. The pure liquid oxygen is stored for further processing as the major source of volume production of gaseous oxygen. Passing this liquid through evaporator heaters at 2200 psi converts it to dry oxygen gas.

Part of this gas is piped to the cylinder filling stations, where the standard steel cylinders are filled at 2200 psi, and the remainder goes to the meter which is the entrance to the industrial supply pipeline. This pipeline, supplying dry oxygen to industrial plants all along its route, provides gas for individual plants as usage demands.



The plant's filling station for "bottled" oxygen gas. Expansion engine shown in left rear drives the generator



Five-stage compressor battery, driven by gas engine, takes air through the filter to start the reduction process going

ENCLOSED UNITS TAKE CARE OF MOST INDUSTRIAL APPLICATIONS—Two popular enclosed circuit breakers are these *general purpose* and *semi-dust-tight* designs. Others are: *flush mounting, water- and dust-tight* types. Automatic tripping is clearly indicated by the handle which assumes a position between the easy to see OFF and ON positions. No elements need be replaced to clear faults.

Enclosed breakers range in size from 15 to 600 amps where distribution of low-voltage current of 125 to 600 volts a-c or 125 to 250 volts d-c is required.

INDIVIDUAL BREAKER UNITS HANDLE UP TO 600 AMPS—Trumbull circuit breaker units are encased in rugged black molded phenolic, all with quick-make, quick-break toggle mechanisms that are *trip-free*. Higher ratings (over 100 amps) all use interchangeable thermal-magnetic trips adjustable over a wide range of current without affecting thermal trip points.

For general purpose lighting and industrial power circuits

A complete line of circuit breakers gives AUTOMATIC PROTECTION

Modern industrial plants everywhere are using a completely modern device to obtain overcurrent and short-circuit protection *automatically*. That device is the *circuit breaker*—a completely enclosed, non-tamperable unit that combines the functions of a circuit protection device and a switch.

To be sure they get the circuit breaker that exactly suits their requirements, many of these plants *specify Trumbull*—*complete* from 10 through 600 amps in double- or three-pole construction, and through 50 amps in single pole.

TYPE TQL PLUGS INTO LOAD CENTERS AND PANELBOARDS. It's the first plug-in circuit breaker made that's *quick-make, quick-break* and is the unit used in the new Trumbullite load centers, Trumbullite panels, and NLTQ panelboards. A thermal-magnetic breaker, the TQL stays-in for harmless temporary overloads, trips out *with a time-delay* on excessive overloads—*instantaneously* on short circuits. Ratings: 10, 15, 20, 30, 40 and 50 amps; single-pole, 125 volts a-c. Non-plug-in Type TQ breaker with solderless connectors is available in the same ratings as the TQL and is ideally suited for panelboard installations.

Remember, Trumbull Circuit Breakers are *non-tamperable units* that can cut down on your production delays by assuring faster clearing of overloads and short circuits.

Write for descriptive bulletins on Trumbull Circuit Breakers

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

NEW PRODUCTS summarized for your convenience

Edited by M. E. Heniken

Use the postage-free cards on pages 35-36 and 171-172 to ask for more information on these products. List item numbers of those products in which you are interested.

1—SELF-FORMING PACKING is designed to cut inventory

Because it gives the user a wide range of packing stock on a single spool and is applicable in a great variety of jobs, Steamfitters' Special Self-Forming Packing speeds up the work and reduces packing costs, according to manufacturer. Self-forming, self-lubricating and leakproof, this packing in handy rope style forms itself into a seal the size and shape of the stuffing box or fitting into which it is placed. Only one size to stock, it comes in ½- or 2½-lb spools. Good results are reported with installations in reciprocating boiler feed pumps, centrifugal oil pumps and valves, against oil, gasoline, many solvents, mild acids and caustics, steam, air, water. Packing Div., Flexrock Co.

2—WAREHOUSE TRUCK has rubber-tired wheels

Designed for long service where heavy loads are to be moved and rubber tired wheels desired, this is 54 in. long overall, 28 in. wide, and 42 in. high at the handle. The platform top is 14 in. off the floor and built to 3/16 in. plate welded to four supporting channels running lengthwise. The handle is 1¼ in. pipe welded to the supporting frame. Two of the four roller-bearing, rubber tired wheels are rigid; the two at the handle are swivel casters. The truck weighs 300 lb. The Palmer-Shile Co.

3—DUAL-PURPOSE OIL acts as lubricant, preservative

The internal combustion engine temporarily taken out of service for storage or shipment must be lubricated for service preceding or following the stand-by period, and protected against rust and the acidic products of combustion while not in use. Intended to eliminate the need for using separate products, Texaco Preservative Oil 10 and 30 (two grades) is said to combine special additives developed to assure preservation of internal engine surfaces with motor oil additives of the type used in heavy duty lubricants. Manufacturer says this new lubricant-preservative, when functioning as a lubricant, need not be changed until the engine has reached the normal drain-and-refill point, and is compatible with qualified heavy duty motor oils. The Texas Co.

4—TOWING DEVICE lets fork trucks spot semi-trailers

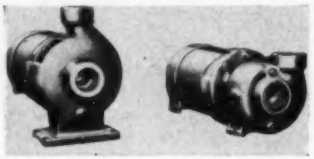
Tractors are not always immediately available when needed to spot semi-trailers at loading docks and costly delays result. To avoid this situation, a new attachment for fork lift trucks is announced. It is a simple device, designed to slip over the forks of the truck, where it is fastened by a chain. A cross member, having a 3-in. hold in the center, serves as engaging plate. It is intended for use on 6000- to 10,000-lb. capacity fork lift trucks and is said to make the moving and spotting of empty trailers a simple matter by pulling or pushing them. Industrial Truck Div., Clark Equipment Co.

5—TRANSFORMERS for 1000-w mercury lamps; two types

One type of these new 1000-w mercury transformers is for the operation of the H-12 lamp, and the other for the H-15 lamp. Each line includes transformers for operation on 115-, 230- and 460-v circuits. Core and coil assemblies are impregnated with a polymerizing varnish and baked for protection against moisture. Designed with a large wiring compartment, ½- and ¾-in. knockouts color-coded and tagged leads and sturdy mounting brackets, the transformers have three-line matching voltage taps for efficient lamp operation and maximum lamp life. Jefferson Electric Co.

6—CLOSE-COUPLED PUMPS come in new packaged line

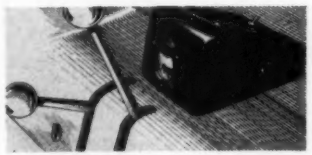
A packaged line of close-coupled pumps, company's Types SAC and JMC, covering a capacity range from 5 to 150 gmp and heads from 0 to 110 ft at speeds of 3500 rpm. This packaging is to assure off-the-shelf delivery and the line includes 29 combinations in ¾-, 1¼-, 1½- and 2-in. sizes and available with either three-phase or single-phase motors. The casings are



vertically split—pump and motor are supported on feet cast integral with pump—suction is on the end and discharge is vertical. Aurora Pump Co.

7—BATTERY INDICATOR for use on industrial trucks

This charge indicator can be mounted so the operator can see the dial at all times, thus giving him instantaneous readings of the state of the battery



while his truck is operating. A three-colored dial shows whether the battery is full, half-full, empty or "in danger." Changing batteries as soon as they register empty prevents repeated over-discharge which shortens battery life, company points out.

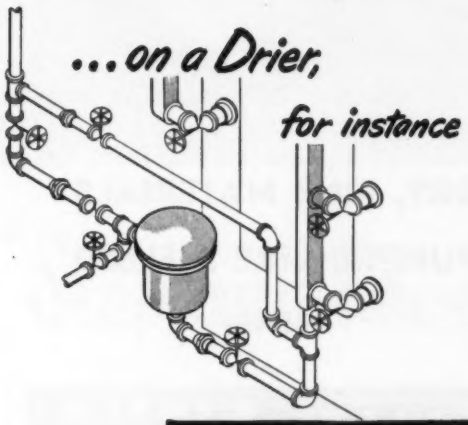
The indicator, a Wheatstone bridge type instrument, is adjustable by means of a series of resistors for 3, 6, 12, 15, 18 and 24 cell batteries. It is enclosed in a metal case, and balanced to read accurately regardless of its mounting or the truck's position. A toggle switch disconnects the indicator from the battery during charge. Gould-National Batteries, Inc.

8—FLOW METER for difficult measuring conditions

Accurate measurement of flow of liquids and gas under difficult conditions is claimed possible with the Potter-Brown Flow Meter. It is designed to handle toxic or corrosive substances, viscous liquids or other fluids under pressures to 20,000 psi and temperatures from -269 C to 1200 F. This meter

(Continued on page 138)

Example of Steam Trap Durability



THE INSTALLATION

On heavy-duty, steam-heated tumbler-type drier at American Linen Supply Company, Cincinnati.

THE HISTORY

A high discharge capacity trap was needed to operate this drier 16 hours daily under heavy loads, with 125 psi. steam. Specifications called for rapid, fully automatic condensate removal to insure fast warm-ups and a steady flow of hot, dry steam to the drier. Naturally, the lowest possible trap maintenance cost was also wanted.

The choice was a Crane 150-Pound Inverted Open Float Steam Trap, carefully selected for adequate drainage capacity, and above all, properly installed.

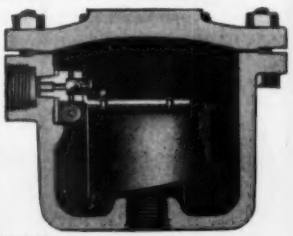
In service more than 8 years and never needing any repairs or new parts, the Crane trap has given complete satisfaction. Total maintenance expense: periodic routine inspection only.

TRAP SERVICE RATINGS

SERVICE LIFE:	More than 8 years-Heavy duty
SUITABILITY:	High discharge capacity
MAINTENANCE COST:	None-Routine inspection only
SPECIAL FEATURES:	Simple, dependable mechanism
OPERATING RESULTS:	Fast warm-ups-Steady even heat
PRICE:	Good Buy
AVAILABILITY:	Stock item in Crane line

THE TRAP

Crane Iron Body Inverted Open Float Steam Trap, for 1 to 300 pounds saturated steam working pressures. Small and compact in all sizes, yet has high discharge capacity. Patented ball-type seating gives positive pressure seal. Simple operating mechanism with only one moving unit assures durable, trouble-free performance. See your Crane Catalog or your Crane Representative for complete data on these highly efficient traps.



The Complete Crane Line Meets All Valve Needs. That's Why,

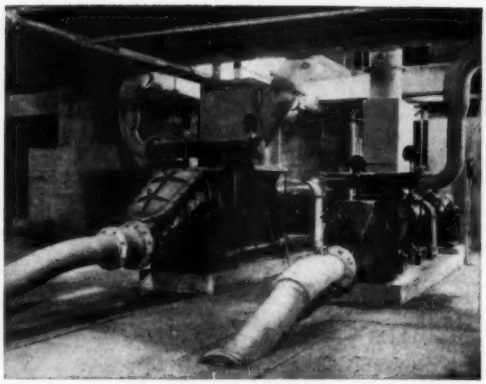
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

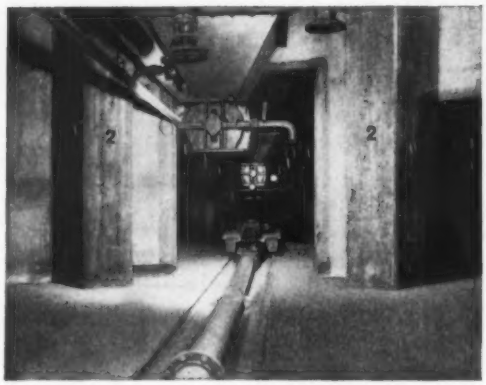
CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Fuller-Kinyon 9-inch Type H Pump (left) conveys 80 tons of dry, raw materials an hour, a distance of 592 feet; the 8-inch Type H Pump conveys dry, pulverized material a distance of 502 feet from mills to silos.



Fuller-Kinyon 7-inch Type H Portable Pump conveys 400 bbl. of finished cement a distance of 398 feet from silos to packer bins.



DRY, FINE MATERIALS PUMPED LIKE A FLUID

with the

FULLER-KINYON
CONVEYING SYSTEM

Typical Materials Conveyed By Fuller-Kinyon Systems

Asphalt filler dust
Barytes
Bauxite
Catalysts
Cement (Portland)
Cement raw Materials
Chalk
Clays (dried)
Coal (pulverized)
Coke dust
Dolomite (pulverized)
Feldspar
Flue dust
Fly ash
Fuller's earth
Gypsum (calcined)
Gypsum (raw)
Lime
Limestone (pulverized)
Magnesite
Manganese dioxide
Ores (pulverized)
Phosphate rock (pulverized)
Rock dust
Soda ash
Starch

Large quantities of dry, pulverized materials—aerated to the point of fluidity—can be pumped quickly to storage bins and silos, packer bins, bulk-loading stations and between processing points, *just like any fluid.*

The Fuller-Kinyon Conveying System has the advantage of stable operation under varying loads, and offers a wide range of capacities to choose from. The System's network of air-tight ducts allows materials to flow horizontally, vertically, and around corners . . . an economical arrangement for process plants with limited space in which to install pulverized material-conveying equipment.

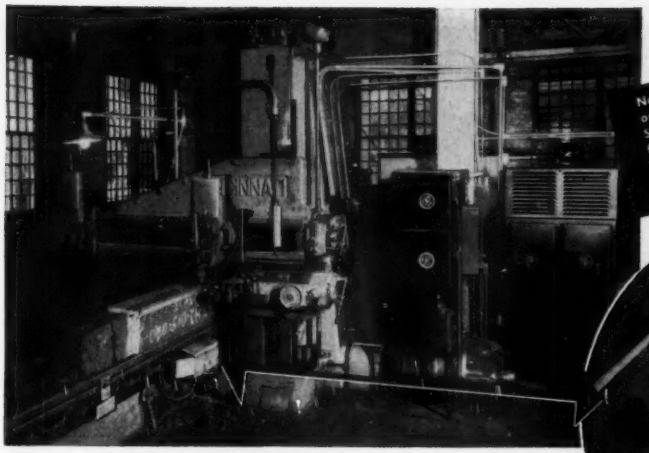
If your present bulk handling system does not have these advantages—ask a Fuller engineer to survey your set-up. There's no obligation on your part, with a wealth of new facts to be gained on economical conveying.

Fuller

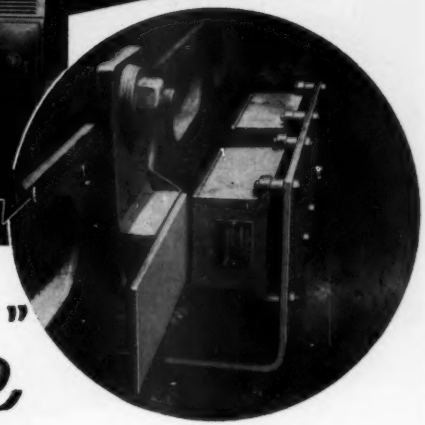
DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS—FEEDERS AND ASSOCIATED EQUIPMENT

FULLER COMPANY
Catasauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4

P-135

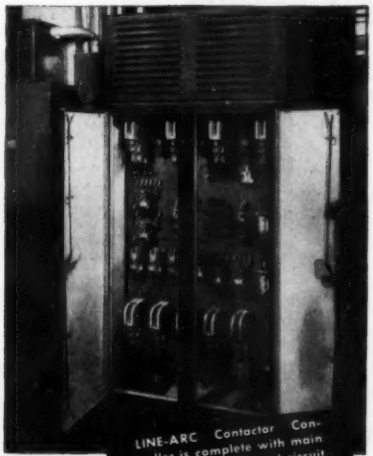


Note the air-gap between the operating-vane and the Limit Switch units. The planer has just finished a cut and will be automatically returned for another cut as this vane passes over the "return" limit switch face.



"Stop and Reverse"

all done automatically by EC&M *Air-gap* Impedance-electronic Limit Switches



LINE-ARC Contactor Controller is complete with main line and fused control circuit knife switches and includes all protective features necessary for the safe operation of planer motors.

Operating silently through an air-gap (without impact or shock), these Impedance-electronic Limit Switches automatically reverse the planer at the end of each stroke.

For this operation, as well as controlling other heavy machinery, these Impedance-electronic Limit Switches offer the advantages of accuracy, freedom from maintenance, and savings in production costs.

One for "return" and one for "cut," the switches are mounted on the side of the planer-bed. They are completely enclosed and protected by a sloping cover which diverts chips to the floor. Two steel operating-vanes, 1/8-inch thick, are fastened at opposite ends of the planer table. The location of these vanes is adjustable to suit the length of stroke desired.

Ask for Booklet 927 describing these unique switches. Let's discuss their possible application to your requirements.

E&M

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

Increase Your Storage Space

Reduce your Handling costs

Strong Barret Storage Racks keep stock organized. Barrett Box-Top Skids provide unit-load moving to any location.

...with BARRETT storage rack system

Take a good look at your present storage space. Is it spread all over the plant? Do narrow aisles make stock hard to reach? Are supplies "buried" when you want them quickly? Is space wasted? Do you need more floor space?

If so, you need the Barrett Sectional Storage Rack System . . . the flexible, practical, low-cost method of storing barrels, drums, boxes, skids, dies and open stock to ceiling height where every cubic foot pays its way.

Barrett Storage Racks reduce handling costs, too. Containers are always accessible—quickly inventoried—old stock can be moved first, no rehandling. Compact Barrett Racks can release excessive storage room for productive use—*THAT'S REAL MONEY-SAVING!*

And racking is done so quickly, so easily with a Barrett Portable Elevator. Regardless of the size or nature of your business, the *complete* Barrett Storage System can be profitably applied to your plant. A Barrett Engineer will gladly discuss details and develop a Barrett installation exactly suited to your needs.

Write for Bulletin 5221.

Efficiency at its best. Drums stacked ceiling high. Stock plainly in view—easily moved in and out with a Barrett Portable Elevator.

Storage in bins mounted on skids or pallets will give you the utmost storage capacity per square foot of storage space—stock always "put away" yet easily and quickly accessible.

BARRETT-CRAVENS COMPANY
4649 Western Blvd., Chicago 9, Illinois
Representatives in All Principal Cities
Canadian Licensee: S. A. Armstrong, Ltd., Toronto, Canada

Barrett Handling Equipment

BARRETT

ONE MAN DOES MORE THAN 3 OR 4 . . WITH A BARRETT

Keep Power Flowing with RoZone-RoPrene® cable

Material shortages and tight controls are bad enough. When you add to them the "down time" cost of idle plant equipment, resulting from power failure, you've really got a "headache."

You can save yourself this kind of a "headache" by standardizing on RoZone-RoPrene for your plant power distribution system. How? Because you get *double protection* against failure. First, the insulation, RoZone, is a *premium* oil-base compound made for high quality and dependable performance. It has high dielectric and impulse strength. And, it's immune to the effects of aging, heat, sunlight and moisture. Further, where high voltages are involved, it is exceptionally resistant to the effects of corona and ozone cutting. Second, the tire-tough RoPrene (Neoprene) sheath has superior resistance to abrasion, oils, acids, alkalies, flame, moisture.

A rugged cable, RoZone-RoPrene is designed to keep power flowing even under the toughest conditions in paper mills, steel mills, chemical plants . . . any installation where dependability and long life are of utmost importance. It is available as single or multiple conductor for service ratings up to 8000 volts. It may be installed direct in earth, in conduits, aerially . . . or in circuits combining all three.

The Rome Power and Control Cable Catalog will show you how you can save purchasing "headaches" with RoZone-RoPrene Power Cables. Mail the coupon today for your copy.

It Costs Less to Buy the Best

ROME CABLE CORPORATION, DEPT PE-9, Rome, N. Y.
Please send me a copy of the Rome Power and Control Cable Catalog.

Name ..... Title .....

Firm ..... Address .....

City ..... Zone ..... State .....

ROME CABLE
Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA

*QUARTER-MILE ROADBED...sun-baked, ice-swept...*YET STILL ON THE MOVE AFTER 14 YEARS OF COAL HAULING SERVICE!!!

Photographs may not lie; but, here's one that falls far short of telling the whole truth about the remarkable performance records chalked up by this Republic Rubber's Coal Handling Conveyor Belt.

But, then it's quite a story! You can see for yourself there's lots of sky overhead and that means sun . . . constant, unrelenting sun beating down on the conveyor belt surfaces, until seasonal changes bring about onslaughts of rain, snow and sleet.

The load, of course, is coal . . . an abrasive, mine run coal that's dropped through chutes and carried by the belt to stockpiles located throughout the dock area.

With these facts in mind and knowing that when the ship moves out, there's nothing to protect the belt against spraying lake water, consider this:

The belt is now fourteen years old and still going strong!!!

Purposefully, we've left the photo unretouched to show you just what a 14-year old Republic Rubber Conveyor Belt really looks like . . . to show you just how well a Republic Conveyor Belt stands against the ravages of time, hard labor and all the elements can throw at it. Incidentally, the dark spots you see on the belt's surface aren't worn places at all. That's water . . . water that makes ordinary conveyor belts mildew and prematurely fail, but holds few terrors for Republic Conveyor Belting because they're "mildew-proofed"!

It's to your advantage to learn why Republic Conveyor Belts like this can year in, year out, many times outperform and outlast other brands of belting.

Despite abrasion, impact, flexing, weathering or contact with heat, oil and chemicals, Republic Conveyor Belts continue to be your best insurance against breakdowns, short life and high handling costs.

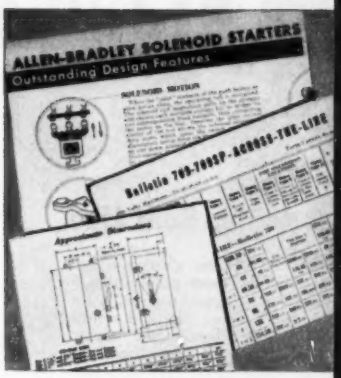
Write us today for the name of your local Republic Rubber Distributor who can offer expert advice and fast service on all industrial Rubber Products.

Remember, whether it's hose, belting, packing or any one of hundreds of different molded and extruded specialties . . . **if it's built of rubber, Republic builds it better!**

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS



CONTENTS

- Outstanding Design Features
- Sizes • Ratings
- Prices
- Dimensions

You will find the

motor control information

you want in the

ALLEN-BRADLEY HANDY CATALOG

CONTENTS

- Application
- Operation and Construction
- Selection of Motor Elements for Motor Protection
- Conductor Size and Overcurrent Protection for Motors
- Sales and Service

Here is a handy reference guide for the busy plant engineer or maintenance man who regularly works with, specifies, or buys manual or automatic starters, contactors, push buttons, limit switches, relays, timers, and other control components.

It is a valuable guide with ratings, dimensions, and prices; all arranged for quick and easy use . . . complete, concise data on the application, operation and construction of all units . . . precise data on conductor size and overcurrent protection for motors. No matter what kind of motor control problem, whether manual or automatic, a.c. or d.c.—this Allen-Bradley Catalog will help you.

The heart of the broad Allen-Bradley line is the time-tested A-B Solenoid Starter. It has maintenance free, double break silver alloy contacts. Its simple one-piece solenoid mechanism is trouble free. For quality motor control, specify Allen-Bradley.

Allen-Bradley Co., 1317 S. First St., Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Announcing the most rugged TRANE gas unit heater ever built!

Now! A Heater Built Like a Boiler!

Heavier gauge steel throughout! Bigger, more powerful motor! New *steel* fan designed especially for unit heater application! Welded seams all around. Durable "Bonderized" finish.

Even the joints in the heat exchanger have come in for special treatment. TRANE has *eliminated* troublesome gaskets, furnace cement and other joining materials by using beaded and flanged connections to give you trouble-free joints as permanent as steel itself.

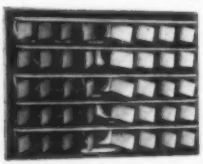
Features like these and other carefully engineered, exclusive details make it possible for you to hang gas heating from the ceiling more efficiently, more economically than ever before.

Have all the facts on hand when you plan your next gas unit heating job. Get the new TRANE Gas Unit Heater Bulletin just off the press. Write TRANE, La Crosse, Wisconsin, for the name of the TRANE Gas Unit Heater Distributor in your area.

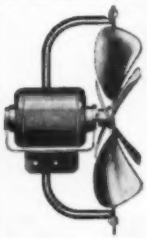
These features mean extra years of trouble-free, thrifty operation

Rugged Construction—Heavier gauge metal throughout means extra safety, extra years of service.

Built Like a Boiler—No gaskets, no furnace cement. Beaded and flanged connections throughout.



Heat Where You Want It—Extra control of heat placement with patented TRANE Louver Fin Diffuser.



Special Trane Fan—Engineered specifically for unit heaters. Wide blade doesn't *chop* air. It pushes—quietly!

A. G. A. and Underwriters' Approved—Have been tested and approved by both the A.G.A. and Underwriters' Laboratories.

TRANE

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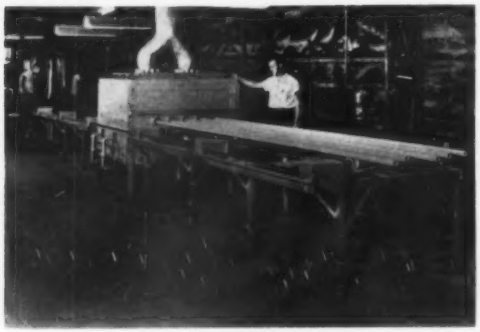
New Furnace Features Continuous Porcelain Enamel Fusing of Pipe

A continuous porcelain enamel fusing furnace has been developed by Barrows Porcelain Enamel Co., Cincinnati, Ohio, to simultaneously fuse porcelain enamel inside and outside of pipe. It has solved several handling problems and improved the quality of the finished product, with the prime advantage of eliminating the handling marks on the coated pipe.



The pipes are first coated with liquid porcelain enamel or "slip." Dried, then placed on rollers adjacent to the furnace, they are advanced into the furnace while being rotated at a uniform rate. Rollers are set at an angle to the direction of travel, to provide traction for moving the pipe. The slow movement of the pipes through the furnace provides the heat required to fuse the enamel to the pipe.

Five standard 21-ft lengths of pipe, up to 2½ in. OD, can be run through the gas fired furnace at the same time. The furnace, with its handling rolls, is 30 ft long, and produces 1800 lineal ft of pipe per shift. An additional unit, in conjunction with the fusing furnace, spot heats the pipe for bending.

Ramp with Retractable Section Speeds Cargo Plane Loading

Cargo handling at the Pan American Airways cargo terminal, Miami, has been speeded as much as 50 per cent by the installation of two ramps of unique design.

The ramps extend from the terminal docks, which are truck bed height, and slope up to the elevation of the plane deck at the loading spot. At the end of each ramp is a 16-ft section that is retractable to clear the planes as they are being towed into position for loading. This section is slid from its retracted position on top of the ramp, against the plane door. A hydraulic lift raises or lowers the end into position flush with the plane deck, and two outboard pipe supports are adjusted to make solid contact with the ground. When in position, with one end supported on the dock and the other on outboard supports, the ramp is as steady as the dock.

Cargo is loaded or unloaded by several means—small hand trucks, carts, or fork-lift trucks that carry crates and boxes on pallets. With the new ramps, these carriers can be taken to deck level, thus eliminating the lift from ground level to the plane deck.

Aircraft Riveting Speeded with Accurate Positioning Mechanism

Aircraft riveting has been speeded at Temco Aircraft Corp., Dallas, Texas with an installation to permit push-button lateral shifting of contoured skin panels.

The lateral shifting mechanism was developed as a means to increase the output obtainable with Lockheed designed work tables. These tables had provisions for remote-control longitudinal shifting along a given row of rivets, but they left all lateral shifting as a manual operation. As a result, at the completion of each line of rivets, the operator had to go first to one end of the table and then to the other, loosening clamps, shifting the panel with a bell crank, and retightening the clamps he had loosened. With the new installation, this manual shifting is eliminated completely.

There are five basic elements in the installation. These are the lateral shifting mechanism which replaces the hand crank, the tension mechanism which releases tension on the contour bars to which the panels are bolted prior to shiting and restores tension after the shift is completed, a solenoid clamp to maintain tension on the indexing bar except during lateral shifts, the actual control mechanism, and a group of electrical and mechanical safety provisions.

Pre-Stressed Concrete Beams Used in Framing Industrial Building

A building addition, which featured the application of steel-saving pre-stressed concrete beams, was recently completed at the F. W. Wakefield Brass Co., Vermilion, Ohio. Pre-stressing these beams, each 60 ft long, created internal stresses to counteract those which would occur during loading. A counter-bending stress was also produced by application of eccentric compression forces.

The building framework consists of reinforced concrete columns supporting eleven pre-stressed beams, and precast concrete struts extending from beam to beam along the outside wall. The beams are 40 in. deep, the top flange is 28 in. wide, and the bottom flange is 12 in. wide. The frame members were joined by welding the reinforcing steel that extended from the concrete members themselves. This welded connection was then covered with a grouting of cement to form a smooth joint. Steel purlins, resting on the concrete beams, support of the roof of this unique manufacturing building.

Battery Charging Rack Designed to Accommodate Trucks

Enclosing an area that had been an open driveway between two buildings provided an ideal spot for a battery charging station at the Marine Corps Depot of Supplies, San Francisco. Eleven General Electric portable battery chargers were installed on a wall rack mounted on one of the buildings. Bumper blocks were installed along the building wall and the floor was laid out for "angle parking."

In the marked-off areas designed for each truck, the lift trucks in need of a battery charge are merely backed into a stall in front of a charger. The battery leads to the truck motors are unhooked, and the charger lead is connected to the battery lead. Thus, the battery is recharged without removing it from the truck. This way, handling the batteries is minimized for safety.

General Motors Metallurgy Laboratory Opened at Technical Center

The new Metallurgy Building, first completed structure in the General Motors Research Laboratories group at the company's Technical Center, Detroit, is equipped for experimental melts of all common metals. It is outfitted with the most up-to-date laboratory and testing equipment available for metallurgical research.

The building is 320 ft long, 110 ft wide and 36 ft high over the bay, with a monitor top 50 ft wide extending its entire length.

Laboratory and office rooms, ranged along a gallery on either side of the foundry bay, are air conditioned with a high velocity system. Atmosphere of the foundry area is controlled with a special ventilation system exhausting through the roof along the monitor.

All dust, dirt and fumes exhausting from the building are removed at their source, thus insuring no contamination of the Technical Center area.

As with all other buildings at the Technical Center, maximum flexibility prevails throughout. For instance, the roof flanking the monitor top is a so-called "soft roof." Entire sections can be removed easily or cut to make way for additional ducts, if necessary, or seal over the areas where ducts are removed. Likewise, grating of the five-foot balcony overhang can be easily removed anywhere over the foundry to accommodate piping or ducts.

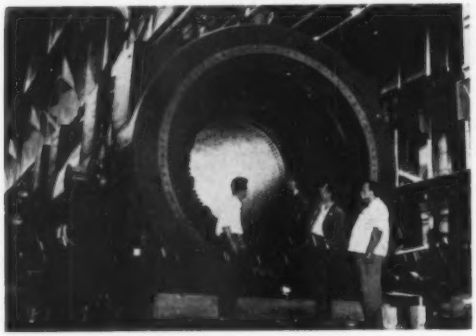
Noise is kept to a minimum with acoustically treated ceilings, both in the main foundry and the laboratory.

The lighting system is sufficient to provide an absolute minimum of 50 foot candles throughout the building. The lighting pattern is based on the building's basic structural unit or module, five ft by five ft.

Building walls are enamelled steel panels and glazed face brick, harmonizing with the general architectural theme of the entire Technical Center.

Delivery of Giant Stator Poses Transportation Problems

Two years of transportation planning were climaxed with delivery of a giant General Electric 401,000 lb stator for one of the world's largest generators, in Consolidated Edison's East River Station, New York City.



Taxing transportation facilities en route from Schenectady, the huge stator moved by rail, water, and tractor-trailer to the powerhouse at 14th Street and East River Drive.

Two railroads, a specially-built flat car, one of the world's largest floating derricks, a special barge, two tugboats and a firm of heavy hauling specialists were needed to move the 30-ft long component of a 175,000 kw generator.

When loaded on the flat car, the 12 ft, 7 in. wide stator was 17 ft, 1 in. above the rails.

At the end of the rail trip, a Jersey City pier, the country's biggest commercial floating derrick, with a capacity of 250 tons, hoisted the load from the flat car to a barge. After a barge trip to the East River, the derrick lifted the stator to a reinforced trailer, for transportation to the power station.

Flexible Valve Shield Protects Operator from Acid Spray

Flexible valve shields made of neoprene synthetic rubber are used in Dupont chemical plants on valves handling acids and other hazardous chemicals. The shield protects the operator from injury if the valve stem packing should fail; it cups the stem and the packing gland and prevents acid from spraying on the operator.

The shield is molded in the shape of a flower pot. To install it, a hole of slightly smaller diameter than the valve stem is cut or punched in the bottom. The valve wheel is removed and the shield pulled down over the stem so that it covers the packing gland. It doesn't have to be wired in place and can be installed while the valve is in service. The edge of the skirt may be trimmed to suit the contour of the valve body.

A major advantage of the shield is its flexibility. It can be turned back to inspect the valve or to tighten the packing gland nuts. Since it need not be removed, there is no risk that it will not be replaced.

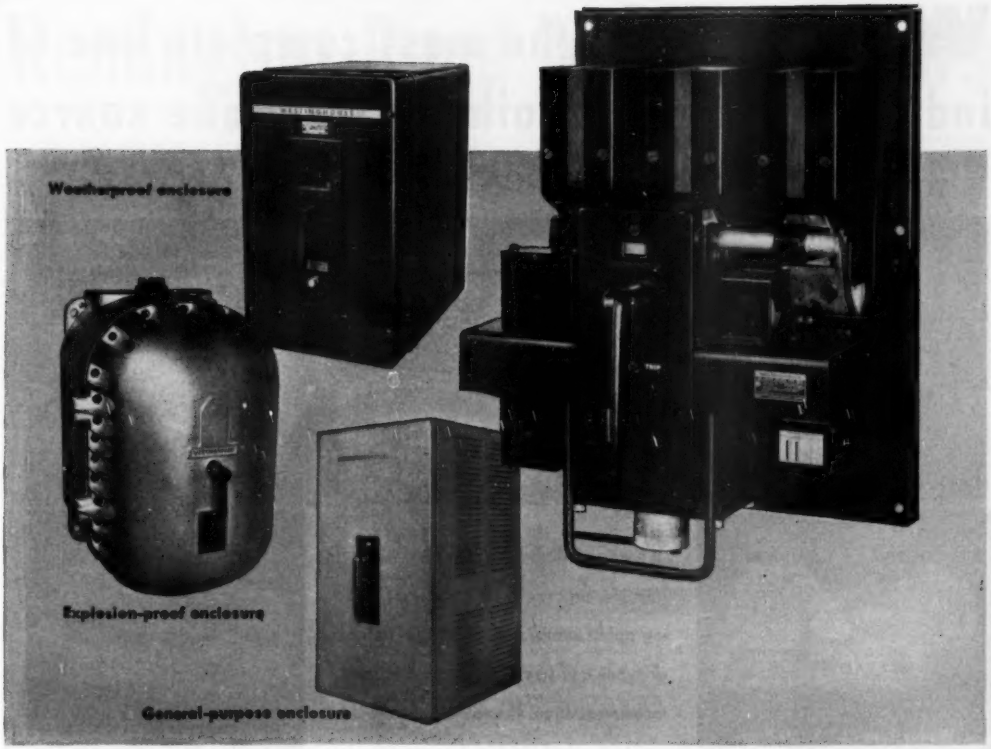
The shield material is resistant to most acids, alkalis and hydrocarbons, and in outdoor applications is much more resistant than natural rubber to deterioration by weathering and sunlight.

Propane Substitutes for Acetylene in Cylinder Closing Machine

A saving in the production cost of forming and closing fire extinguisher cylinder ends has resulted from the substitution of oxy-propane for oxy-acetylene at the Belleville, N. J., plant of Walter Kidde & Company, Inc. Costs have been reduced 30 per cent.

The operation involves heating cylinder ends in induction coils to temperatures of 2000 F, at which time the cylinder is placed on a vertical spindle and revolved. A heating head, utilizing a fuel gas burned with oxygen, maintains the temperature while the semi-automatic machine forms and closes the cylinders. This forming and closing operation is remotely controlled by the operator, working behind a protective panel.

The company realized that production savings were possible if propane could be employed for this use. However, the previously-used heating head was designed for oxy-acetylene, with a jacket for circulating cooling water, and a heating head engineered for oxy-propane was not available. The oxy-acetylene head was redesigned giving consideration to the specific gravity, burning characteristics, BTU content, and operating pressures of propane. With several revisions of the pilot model, the development of an efficient oxy-propane head was achieved making possible the use of the more economical fuel in the process.



Here's *FLEXIBLE* protection for individual plant circuits

Westinghouse DB Air Circuit Breakers are available in a variety of easily installed enclosures for individual circuit applications. Enclosure types include the indoor, general-purpose type for wall mounting, the weatherproof or dust-tight type, and for installation in hazardous locations, the explosion-proof type.

In all DB enclosures, breakers are removable for ease in making cable connections to solderless connectors. Breaker interrupting ratings range from 15,000 to 50,000 amperes for 600 volts a-c or 250 volts d-c.

All DB Breakers feature an adjustable, overcurrent tripping device to provide the basic delay characteristics for flexible, low-voltage motor circuit protection.

For additional information write for Booklets B-4067 and B-4740 to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60787

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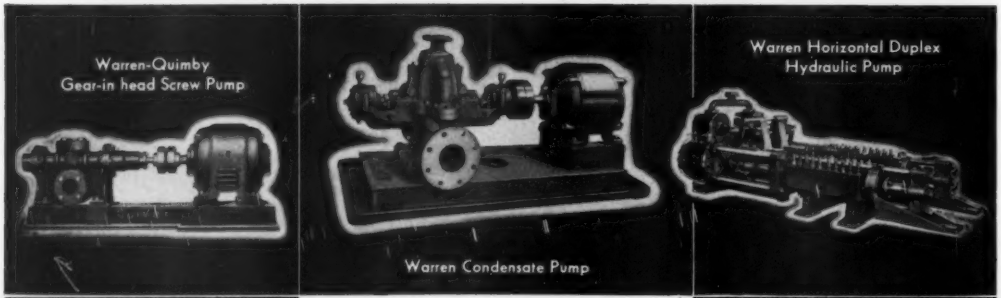
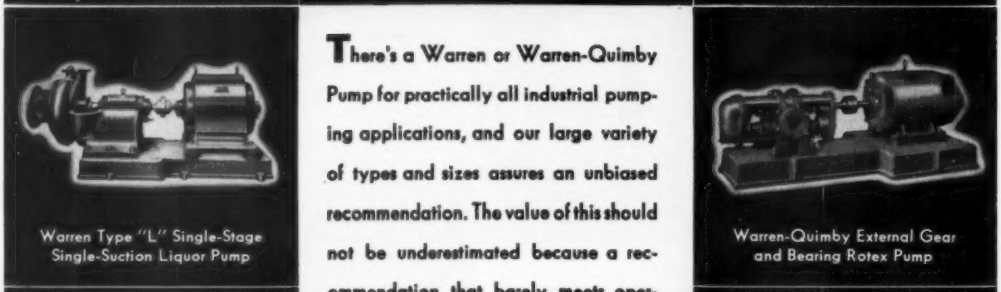


Warren-Quimby Gear-in head Screw Pump

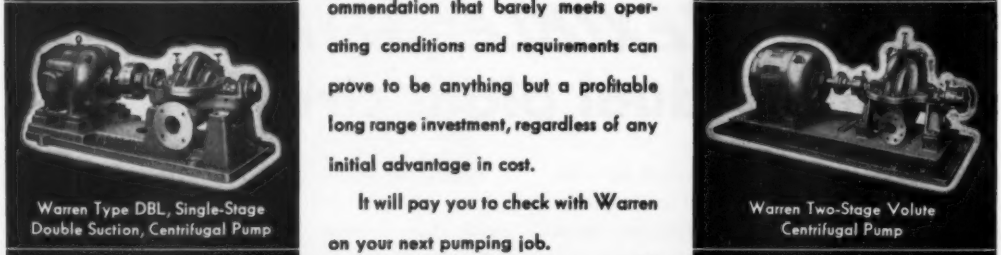
Warren Condensate Pump

Warren Horizontal Duplex Hydraulic Pump



Warren Type "L" Single-Stage Single-Suction Liquor Pump

Warren-Quimby External Gear and Bearing Rotex Pump



Warren Type DBL, Single-Stage Double Suction, Centrifugal Pump

Warren Two-Stage Volute Centrifugal Pump

There's a Warren or Warren-Quimby Pump for practically all industrial pumping applications, and our large variety of types and sizes assures an unbiased recommendation. The value of this should not be underestimated because a recommendation that barely meets operating conditions and requirements can prove to be anything but a profitable long range investment, regardless of any initial advantage in cost.

It will pay you to check with Warren on your next pumping job.

P-57

WARREN QUIMBY PUMPS

WARREN STEAM PUMP COMPANY, INC.

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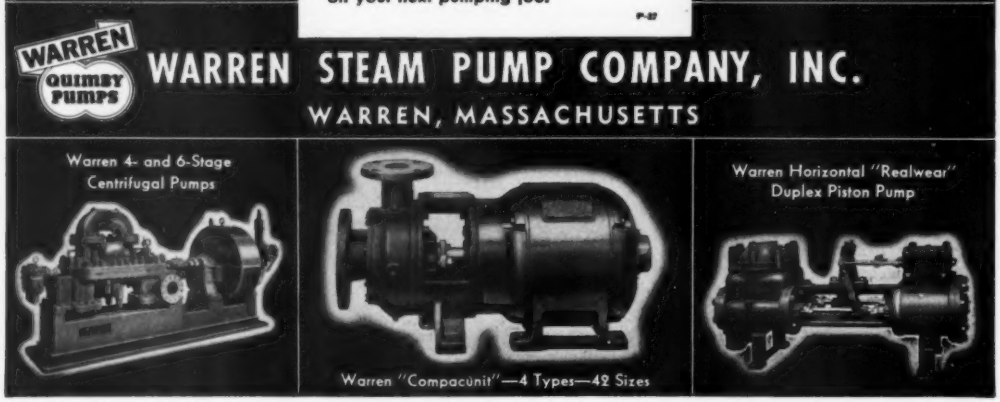


Warren 4- and 6-Stage Centrifugal Pumps

Warren "Compacunit"—4 Types—42 Sizes

Warren Horizontal "Realwear" Duplex Piston Pump

Remington Rand Methods News

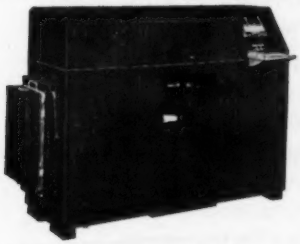
How many ways can a job order get itself "lost" in your plant?

When your assembly floor is running short on a manufactured part, how long does it take to check its status? Do your expediters have to thumb through cards and books? Or track it down by the operations sheet?

It's easy to stop this hide-and-seek game . . . and get business-like control over shop orders. Just file a copy of each order in a *Visible-Tip* folder. The movable signal is set for date of first follow-up (such as receipt of materials). Signal is progressively re-set for follow-up at each work center or other check point.

Just a glance at folders indicates which jobs need expediting. Status of any job is shown instantly by signal position. All folders remain in sequence by part or release number for fast filing and reference. Note four more advantages: 1) No posting is needed to show job progression. 2) Job folder gives more than skeleton information; can be a complete in-process file (even for gathering job cost data). 3) Signaling can be tailored to your scheduling needs. 4) Folder can be re-used. For details on this method, see booklet **LBV-567.**

If your parts production is standardized, Kardex visible records in part-number sequence may give you same follow-up efficiency. See manual **X-1268.**



LOOK INTO OUR 330-2. This new punched-card calculator "explodes" your bills of materials . . . determines your man and machine loads by time units . . . also, your employee efficiency ratings . . . all with speed and accuracy. One operation here completes as many as five or more separate calculations – doing the work of several other machines, or several steps on one. See folder TM-809.

PRODUCTION PICTURE OF AN ASSEMBLY. This method shows you where you stand on each assembly and its components – how many days ahead or behind schedule, and which components are holding up production. Just a glance gives you the complete picture of *actual* against required production and where the expediting is needed. For more information on this visible method, see fully-detailed production control manual X-1268.

How to UP the output of your engineers by specialized technical filing methods

"We have saved many hours of valuable time and effort," reported an engineering department head, "since you reorganized our technical data files. The most important feature of the system is the *visible* cross reference by engineering subject. This gives us quick access to all accumulated information. Time has been saved when originating new designs, and by preventing duplication of previous engineering effort. It has been an indispensable aid to bettering our product and service to customers." See details in case history file **MC-649.**

In another plant, the customer specification file was a bottleneck. Finding a record took too long–and mis-filing was frequent – because the alphabetical breakdown was clumsy and the folders slumped in their drawers. Our specialists speeded up things by a new system with Variadex guides for fast finding, Redi-Files to prevent sagging of folders, and a charge-out plan to keep track of each document. There are *many* special filing methods available for increasing the efficiency of *your* engineering department. See filing manual **LBV-396.**

Or take the plant with jumbled files of correspondence, drawings, catalogs, cards, etc. Record-Stack brought *all* sizes of records into one neat row of uniform cabinets for efficient, time-saving reference. See booklet **SC-677.**

Why not plan NOW to start off next year with files which will save valuable engineering time? There's one unbeatable combination for doing this. Team up one or two of your engineers who know the reference needs – with one of our Records Analysts who knows how to apply modern filing methods. For more on this profitable approach, call our local representative.

Remington Rand

Management Controls Reference Library
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Wayne Air Compressors are checked for volumetric efficiency, performance and operating tolerances. Inspection standards are high, and units must measure up to rigid requirements. Every working part has been designed for minimum maintenance and low operating cost.

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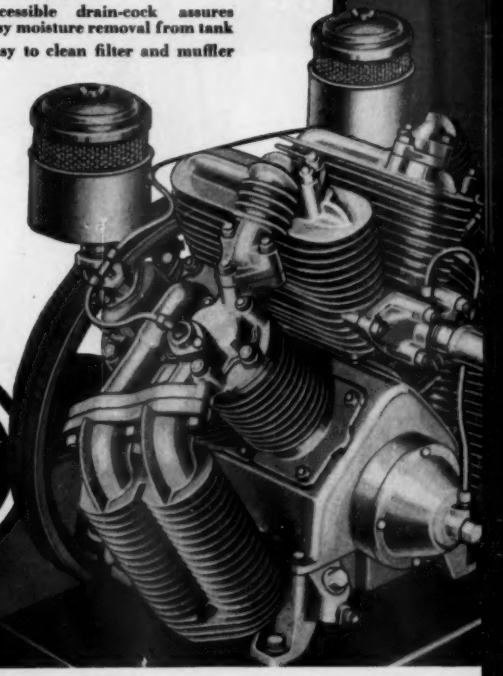

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BUS DUCT CARRIES POWER *in spotless interior of New Plough, Inc. Drug Plant*

Plough, Inc., manufacturers of St. Joseph Aspirin, recently completed construction of a modern, spotless drug manufacturing plant in Memphis, Tennessee, at a cost of approximately $2,000,000. Within this plant is a fine example of how Bus Duct blends into a clean interior design.

Smart Westinghouse Low Impedance and Plug-in Bus Duct carries power overhead and out of the way to all parts of this new plant.

For rapid machine tie-ins, Plug-in Duct has outlets every foot. All sections are prefabricated, fully salvageable, may be relocated easily to meet changing plant layouts. New sliding-type cantilever hangers allow more flexible installation than ever.

Up to 5,000 amperes, Westinghouse Bus Duct has greater current-carrying capacity pound for pound than any other means of secondary power distribution. Four types are available for every service condition, every load demand. The price is competitive.

Call your Westinghouse Representative for facts or write for B-4272-A, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30110

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The Taper-Lock bushing seats evenly along the entire length of the hub. It is self-seating. There is no collar—no protruding part—no flange to prevent uniform compression.

With full contact, Taper-Lock sheaves run true. Made of finest grade of close-grained semi-steel, cast in the Dodge foundry. Precision grooves have identical pitch diameters so that every belt can pull its share of the load.

Sheave and bushing mount as a unit—easy to align on the shaft. Grips the shaft like a shrunk-on fit. Flush hub means safety.

THERE IS ONLY ONE TAPER-LOCK (a patented product of Dodge). Available from distributors' stocks in a complete range of sizes in A-B combination, B, C and D grooves. Also ask your distributors for Dodge Sealed-Life V-Belts. WRITE for complete data.

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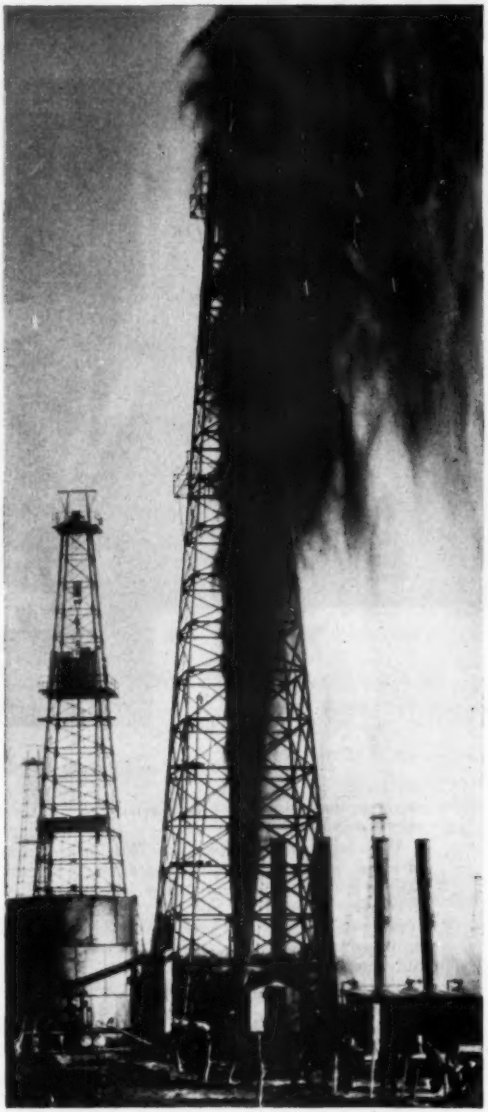
You can't stop a gusher with a bottle cap

You can't stop corrosion with ordinary paints . . .

it takes BITUMASTIC COATINGS!



CORROSION can't be stopped by ordinary paints or conventional protective coatings. They can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic Coatings can!

Unlike maintenance paints, Bitumastic® Protective Coatings are specially formulated from a base* of coal-tar pitch that is, for all practical purposes, impervious to water. When you keep moisture away from an exposed surface, you *stop* corrosion.

Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements—a barrier that is impenetrable. And these coatings provide up to 8 times the film thickness of conventional paint coatings.

Bitumastic Coatings stop corrosion caused by moisture—acid fumes—alkaline fumes—corrosive soil—salt air—heat.

*Hi-Heat Gray contains a metallic base.

There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.

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Now you can have GREATER PIPE LINE MOTION CONTROL IN A MORE COMPACT, LESS COSTLY EXPANSION JOINT!

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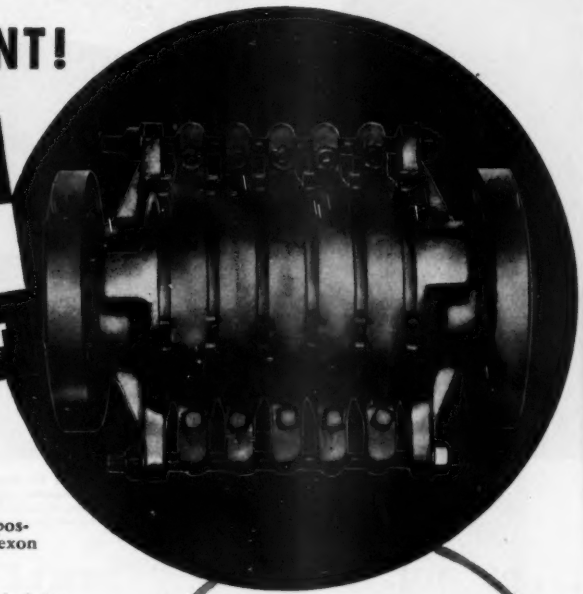


Continuing research and development at Flexonics Corporation have now made it possible to offer design improvements in Flexon Expansion Joints that provide three basic advantages:

1. The face-to-face (over-all) dimension of a joint to handle a given amount of expansion has been reduced.
2. The reduction in size results in a lower expansion joint cost to handle a given amount of motion.
3. Exhaustive tests prove that these joints provide a maximum of motion commensurate with optimum life.

Coupled with such accepted advantages as compactness, ease of installation and freedom from maintenance, these additional advantages make Flexon Expansion Joints the most satisfactory method of controlling pipe line motion for the majority of installations.

Complete specifications are given in the new Flexon Expansion Joint Bulletin. Check this data before you select or specify expansion joints for your plant. Write for your copy, today.

THREE TYPES AVAILABLE

FREE FLEXING—Available in sizes from 3" through 48" I.D. in copper or stainless steel. Suitable for pressures to 30 psi, temperatures from minus 100°F. to 800°F.

CONTROLLED FLEXING—(Illustrated above) Available in sizes from 3" through 48" I.D. in copper or stainless steel. Suitable for pressures to 300 psi, temperatures from minus 100°F. to 800°F.

FLEXONIFLEX—Integral ring type. Available in sizes from ½" pipe through 6" pipe. Suitable for pressures to 5500 psi, temperatures from minus 400°F. to 1600°F.

Flexonics Corporation EXPANSION JOINT DIVISION
1340 S. THIRD AVENUE · MAYWOOD, ILLINOIS

FORMERLY CHICAGO METAL HOSE CORPORATION

Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.

Manufacturers of Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals · Expansion Joints for Piping Systems · Stainless Steel and Brass Bellows · Flexible Metal Conduit and Armor · Assemblies of These Components
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Here's How
THE SHERWIN-WILLIAMS CO.
1...Saved the cost of exponsive floor reinforcement.
2...Stopped vibration-caused structural damage.

This 36" x 50" belt driven horizontal centrifuge on the 3rd floor of the Sherwin-Williams' linseed oil mill in Cleveland is mounted directly on four Korfund type SK Steel Spring Vibro-Isolators. Adjustable checks in these isolators resist belt pull and make a structural base unnecessary — for the simplest installation.

...by controlling vibration

This centrifuge was installed on the 10" thick reinforced concrete 3rd floor in which there was a large rectangular opening directly under the centrifuge for gravity discharge of clarified oil down through the plant. Because of continuous use, with a minimum of time available for cleaning and balancing, vibration from the centrifuge actually cracked the floor.

Sherwin-Williams and their engineers, Osborn Engineering Co. in Cleveland called in The Korfund Co. Together they decided that there were two possible solutions: 1) reinforcement of the floor by pouring another floor over the top and tying the two floors together (expensive, and with no assurance that this would completely solve the problem); and 2) installation of Korfund isolators directly under the centrifuge, with no other changes in the installation and without any further reinforcement of the floor.

Since this centrifuge was running 24 hours a day, seven days a week, they agreed it would be worthwhile to try the isolators first.

The installation is highly satisfactory and has prevented further damage to the building —and the Korfund isolators have more than paid for themselves by eliminating the need for structural reinforcement alone.

There are standard stock Korfund isolators for the majority of installations—special designs when necessary. A selector chart in Bulletin G-104 gives recommendations for both normal and critical conditions, for pumps, compressors, centrifuges, machine tools, presses, hammers and most other processing and mechanical equipment. See Sweet's Catalog Files, or write us for your free copy today.

We'll gladly submit recommendations without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.

THE KORFUND COMPANY, INC.
KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK
48-35R Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

NEW PRODUCTS

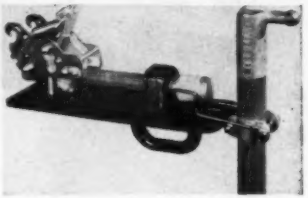
(Begins on page 114)

was originally developed by Potter Aeronautical Co. for aeronautical research, and has recently been improved in cooperation with Minneapolis-Honeywell's Industrial Division to permit all parts, except sensing element, to be encased in a Brown ElecroniK Potentiometer.

Some of the sensing elements of the instrument are extremely tiny, as small as 3/16 in dia; the largest element measures 6 in. and is said to permit high accuracy of flow control up to 4000 gpm. Industrial Div., Minneapolis-Honeywell Regulator Co.

9—SWITCHSTICK ATTACHMENT for cutout operation

Designed for easy switchstick operation of cutouts, including removal or replacement of cutout doors, this new device is a stainless steel fitting for clamping to the head of any standard



switchstick. It can be used for handling of doors with all of company's enclosed, indicating dropout cutouts, 5.2 or 7.8 kv, 50 or 100 amp, manufactured since 1935, and with company's 5.2 kv, 100 amp heavy duty cutouts. The attachment folds back against a switchstick to assure no interference with the ordinary uses of the switchstick. General Electric Co.

10—FORK TRUCK features detachable counterweight

For stevedoring and other applications, where the operating weight of a fork truck may exceed the ship's hoist or elevator capacity, this manufacturer's fork lift trucks are available with a new type of counterweight. Made of cast iron, it accounts for a large part of the truck's operating weight and is held in place by guide pins and heavy steel brackets. It can be removed or attached in less than a minute, company says, by using either another fork truck or a hoist. The Yale & Towne Mfg. Co.

11—SPIRAL-WOUND GASKET is made with Teflon plies

Suggested for process applications where extreme inertness to chemicals is important, this gasket is constructed of alternate plies of Teflon and stainless steel. Its chief advantage is said to be the elimination of cold-flow frequently encountered in a Teflon seal. Trapped between edges of metal, the Teflon can't

LEVER HOUSE

New York City

". . . that Blue-Green Glass Tower"

is another famous

CLARAGE ***installation!***

During the last 40 years Clarage has furnished much of the ventilating and air conditioning equipment installed in office buildings which house America's greatest business enterprises.

A recent installation requiring 27 Clarage ventilating fans is "Lever House," new general offices of Lever Brothers Company.

Lever House provides ideal working quarters for 1280 people. It has every comfort and efficiency advantage which expert planning and modern equipment can provide.

What does American business like about Clarage? . . . first, our resourcefulness in devising ways of meeting your particular requirements exactly — and, second, the ability of our equipment to operate faithfully and economically for a long time to come.

How may we serve your Company?

97 OF AMERICA'S 100 LARGEST CORPORATIONS are users of Clarage equipment . . . This wide acceptance denotes the high quality and reliable performance of Clarage products.

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SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA Canada Fans, Ltd., 4285 Richelieu St., Montreal

Stuck without WARNING

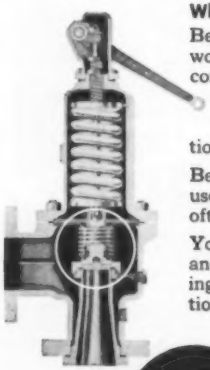
Who's stuck?

Safety valves that weren't safe? The plant which installed them?

None of this was necessary. If you want 100% safety—and you'd hardly want less—there's one sure way to get it—specify BalanSeal or FarriSeal Valves.

Why?

Because they *can't* stick, plug or corrode. Critical working parts are permanently isolated from any contact whatever with the lading.



Because they're unaffected by back pressures in the discharge manifold due to its own operation or to the opening of other valves in the line.

Because these features make it possible for you to use smaller discharge piping, an economy which is often substantially more than valve cost.

You'll be interested in the engineering of BalanSeal and FarriSeal Valves—design which is rapidly gaining acceptance in hundreds of successful installations.

Ask for our "8-Minute Brief."

Your Safety's REAL With FarriSeal

Farris ENGINEERING CORP.

416 COMMERCIAL AVE., PALISADES PARK, N. J.

1190-R

NEW PRODUCTS

(Begins on page 114)

flow when bolting is applied. The flexibility of the gasket structure provides necessary resiliency for self-adjustment and efficient sealing regardless of fluctuating temperatures at the joint.

These gaskets are unaffected under high pressures, company points out, and can be used at temperatures from -90 to 500 F. They're described as tough, durable and non-absorbent, and are made with a number of metals. Flexitallic Gasket Co.

12—CHAIN PULLER works both two- and three-way

Pulling tractor rear wheels, pulleys, fly wheels and other tough pulling jobs can be done easily and quickly with this new universal chain puller, it is announced. The puller is built for use

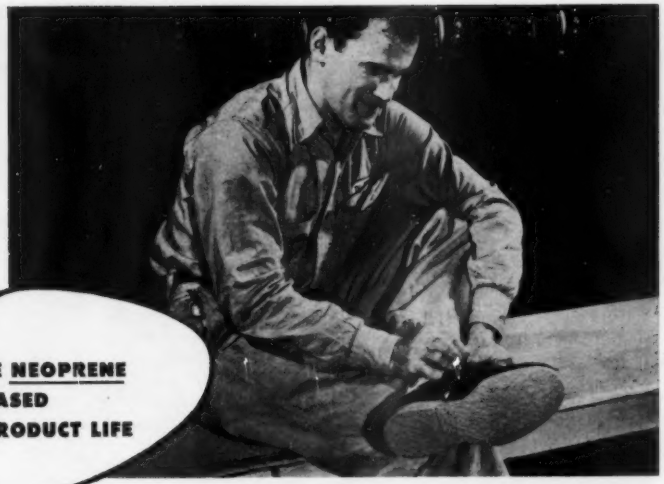
with manufacturer's well-known 17½-ton hydraulic ram. It operates both as a two-way or three-way puller and comes equipped with 3-ft, 3720-lb proof test ⅜ in. chain with a grab hook on one end. Self centering hooks with a screw adjustment serve to permit a straight even pull without cocking. Owatonna Tool Co.

13—PROCESS TEMPLATE has material flow symbols

The No. 55 Operation and Flow Process Template provides symbols standardized by the ASA for use in process charts to depict the flow and handling of materials. Each symbol has six sizes. The template is 5⅜ by 3¾ in., is made of mathematical quality plastic with matte finish and has the printing on the matte surface to minimize wear. List price is $1.50. RapiDesign, Inc.

14—STEEL COUPLING can be joined to tube or pipe

The Quikupl is a stainless steel fitting designed to reduce assembly costs and permit use of less expensive, lighter-wall stainless steel tubing. Chief advantage claimed is that it can be joined to tube or pipe without threading, flaring, sweat-soldering, brazing or welding. With this fitting the pipe or tube is cut to length, deburred and in-



ANOTHER CASE WHERE NEOPRENE MEANS INCREASED EFFICIENCY, LONGER PRODUCT LIFE

Neoprene soles resist abrasion, heat, oil... add long wear to work shoes

Rugged neoprene soles are setting new standards of durability in work shoes of all types. Under the toughest service conditions, these comfortable resilient soles frequently outlast shoe uppers.

In factories, neoprene soles resist attack from oil, grease, most chemicals . . . won't soften even when exposed to hot steel flooring. Outdoors, construction men count on neoprene soles to give them long wear despite daily contact with jagged rocks that cut and chip ordinary soles. That's why you'll find rugged soles of all neoprene, neoprene-cord, neoprene-cork, and neoprene crepe on many of the most popular work shoe and safety shoe styles.

In shoe soles, as in thousands of other products, Du Pont neoprene means longer service . . . fewer replacements. While Du Pont makes no finished products of neoprene, your manufacturer or distributor will gladly tell you about the neoprene products he supplies.

SEND FOR "THE NEOPRENE NOTEBOOK"

Each issue describes new, unusual applications of neoprene that will be of interest to you. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division F-9, Wilmington 98, Del.

DU PONT

150th Anniversary

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

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The Rubber Made by Du Pont Since 1932

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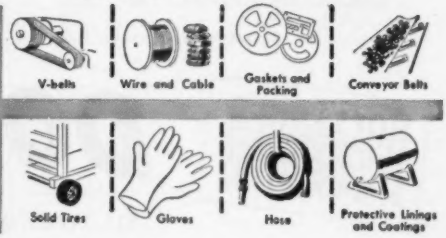


One of a battery of Staynew Pipe Line Filters keeping impurities out of process compressed air at the Taylor Instrument Companies, Rochester, N.Y.

Staynew Pipe Line Filters *help* *Taylor Instrument Companies* maintain High Quality, Accuracy...

Pictured is part of an assembly line at the Taylor Instrument Companies where highly skilled technicians use compressed air to form the bulbs of precision fever and industrial thermometers. Impurities, no matter how minute, are kept from entering the .002" bore to maintain high quality control. That's why the Staynew Model CPH-03 Pipe Line Filter is standard equipment at every bench.

Staynew's basic design first eliminates larger particles mechanically. Then, finer air-borne material is removed by the radial fin filter insert. This double action principle reduces the load on the insert making frequent cleanings unnecessary.

There can be no compromise with quality. Millions of thermometers will pass through the Taylor production lines this year where *Accuracy First* is the watchword. Wherever used, Staynew Filters give day in and day out dependable service with low maintenance cost.

Send for Pipe Line Filter Bulletin B-1A

Representatives in Principal Cities

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

55 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

NEW PRODUCTS

(Begins on page 114)

serted in the fitting, then tightened.

In design, the new fittings resemble standard elbows, tees, ells and other universal shapes, with the addition of a clamp which is an integral part of the fitting. This clamp can be tightened with a simple hex wrench. Inside the fitting is a synthetic sealing ring, designed to provide and maintain a squeeze fit regardless of commercial tube and pipe tolerances, and pressure in the line, from either direction of flow, jams it into a negative fit and seals space between fitting and tube.

Now being manufactured (by Cooper Alloy Foundry Co.) in tees, couplings, ells and adapters in Types 304 and 316 stainless. For use at temperatures to 275 F., depending on the corrosive agent involved., Quikupls are in the 150 psi pressure class. Peter A. Frasse & Co., Inc.

15—MAGNETIC PULLEYS have increased pulling power

These redesigned 20- and 24-in. dia magnetic pulleys are announced as offering 30 per cent more pulling power. Their increased strength is credited to the addition and special positioning of more Alnico V, powerful magnetic alloy. More uniform lighter weight and stronger construction is featured in the improved pulleys. Eriez Mfg. Co.

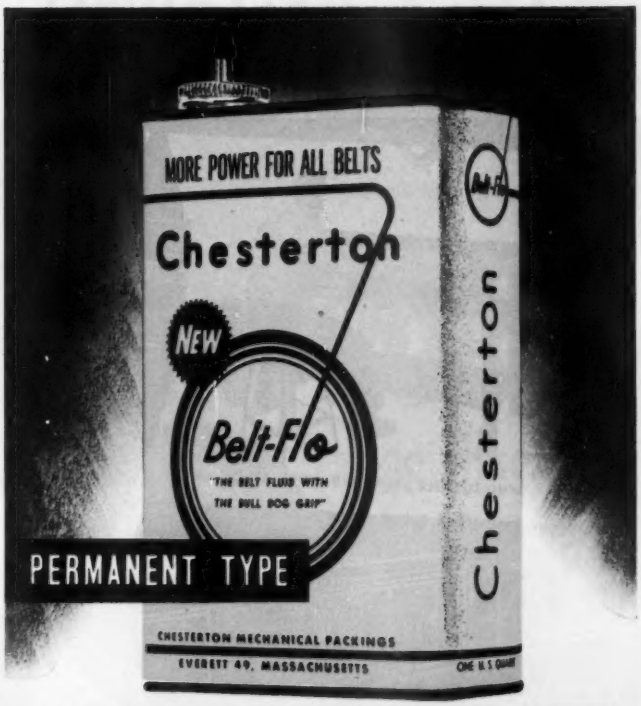
16—FORK LIFT has independent rear wheel suspension

This manufacturer's Mobil-Spring wheel suspension has been engineered into a new 3000-lb sit-down type fork lift truck. The suspension, designed to cut down driver fatigue and reduce shock, consists of a heavy-duty spring and an airplane type shock absorber for each rear wheel. Mounting and dismounting are easy, and the simple operating levers are conveniently located on the right side. The lift mechanism is a roller chain lift with hydraulic tilt cylinders.

The equipment is powered by a heavy duty air-cooled three-cylinder engine and has a two-speed transmission. Standard mast heights for this model, the HR, are 63, 72 and 83 in. Mobilift Corp.

17—IMPROVED COUPLING offers less pressure drop

By streamlining the inner valve of this coupling and using a square cut synthetic rubber gasket, perfect sealing has been accomplished, manufacturer states, and pressure drop has been decreased. It can be connected or disconnected with the fingers. When disconnected, the coupling is self sealing on the socket side but can be made self sealing on both sides without loss of liquid. Currently being produced in pipe sizes from ⅛ to 1 in. dia, it is designed to withstand temperatures



INCREASE BELT POWER OR YOUR MONEY BACK!

Belt-Flo is unlike any other dressing you have ever used on flat or V belts. *It holds its pulling power!* It contains neither rosin nor asphalt. It will not build-up on belts, pulleys or sheaves. It will not pick up dirt or dust. It is colorless and nontoxic. Send the coupon for your $2.25 quart can. Try it on any belt drive. Use a tachometer: If Belt-Flo does not increase belt power and hold it days after other dressings slip, just return the empty can within 60 days and get your full money back. You must send the coupon now to take advantage of this money-back offer.

Chesterton

A. W. CHESTERTON CO.
6 Ashland St., Everett 49, Mass.

Have your nearest jobber send us one quart can of Belt-Flo and invoice us for $2.25. If, in 60 days, we are not satisfied that Belt-Flo increases and holds power better than any other dressing, we can return the empty can and get our full money back.

Signed_____ Position_____

Company_____

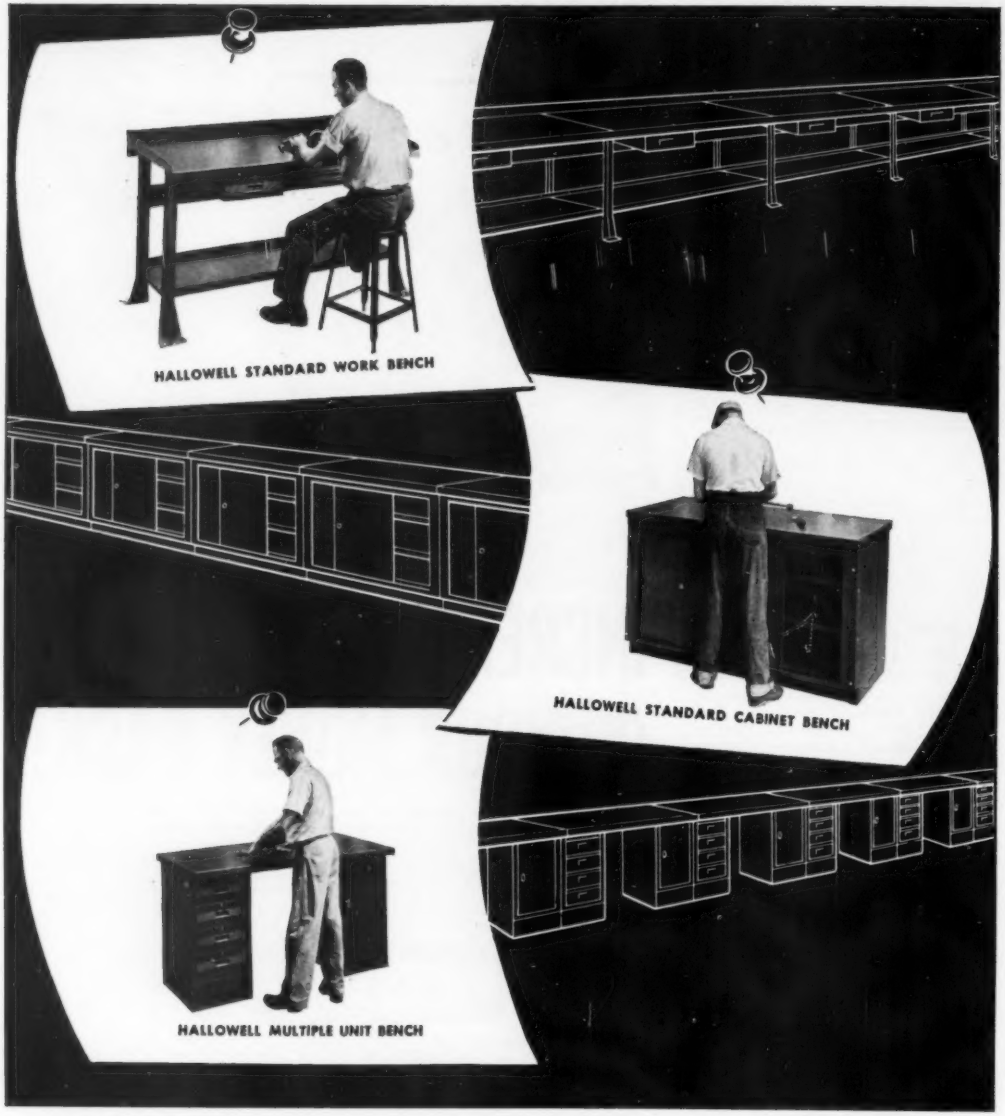
Street_____

City_____ State_____

Your Order No._____ Date_____

ALL 3 HALLOWELL BENCHES

can be installed individually or in continuous line



Standard, interchangeable HALLOWELL Benches can be used individually as required. But, unlike with ordinary benches, multiple units can be quickly and easily assembled to make a continuous bench of any desired length. Write today for literature. STANDARD PRESSED STEEL CO., Jenkintown 26, Pennsylvania.

HALLOWELL SHOP EQUIPMENT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

NEW PRODUCTS

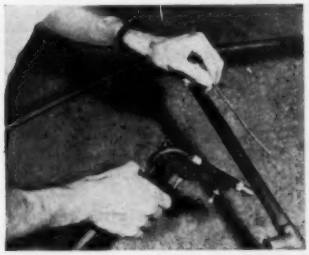
(Begins on page 114)

from -65 to 350 F. Aluminum alloy is standard, but the coupling can be made in brass, carbon or stainless steel.

Principal applications of this moderately-priced coupling include motor driven generators, water and paint lines and similar uses. E. B. Wiggins Oil Tool Co., Inc.

18—AUTOMATIC TORCH lights and shuts off easily

Savings in time, money, and gas, and greater fire safety are reported for the "Torch-O-Matic," an automatic acetylene-air gas torch. Pistol shaped, it is designed to light at the squeeze of



the trigger and shut off upon release and described as well suited for "on-again, off-again" jobs, such as loosening frozen nuts and bolts, as well as maintenance or production work requiring soldering or brazing.

Squeezing the spring-loaded trigger simultaneously opens the torch gas valve and sparks the heavy duty flint for ignition. The trigger can also be locked open for continuous flame. The Torch-O-Matic weighs only 12 oz, provides instantaneous heat to 2800 F. Combustion tubes are ⅛-, 3/16- and ¼-in. sizes to permit use of the torch for heavy heating jobs to fine precision work. Velocity Power Tool Co.

19—FAUCET REPAIR SET has 1079 replacement parts

Giant Handy Andy No. 100 is intended to overcome faucet repair troubles and enable mechanics to re-washer and repack any leaky faucet quickly and efficiently regardless of its age or model. The assortment of 1079 parts includes all sizes of beveled and flat bibb washers, top bibb gaskets, bonnet nut packings and bibb screws. An added feature is a 10-24 tap and handle for replacing rotted or corroded bibb screws. The parts are assembled in a metal carrying case. Inside the cover is an index of parts and sizes and an illustration of company's system for rebuilding faucets. J. A. Sexauer Mfg. Co.

20—PLEXIGLAS SAFETY GUARD held by magnet

The improved Magnetic Grip Shield for machine tools, food processing and the like, gains its versatility from a sheet

- Conductor doesn't have to be centered for accuracy, (toroidal wound transformer)
- Pocket-size, belt-mounting
- Covers 9 ranges
- Probe jaws completely insulated
- Test lead plug insulates itself when removed from meter
- No-rim window floods scale with light

only AMPROBE has these features!

AMPROBE "600"
0-15/30/60/150/300/600 amps A-C
0-150/300/600 volts A-C
$59.50 complete with cowhide case and voltage test leads.

AMPROBE "1200"
to 1200 amps A-C
$67.50 complete

AMPROBE "300"
to 300 amps A-C
$49.50 complete.

Measures current instantly without interrupting service

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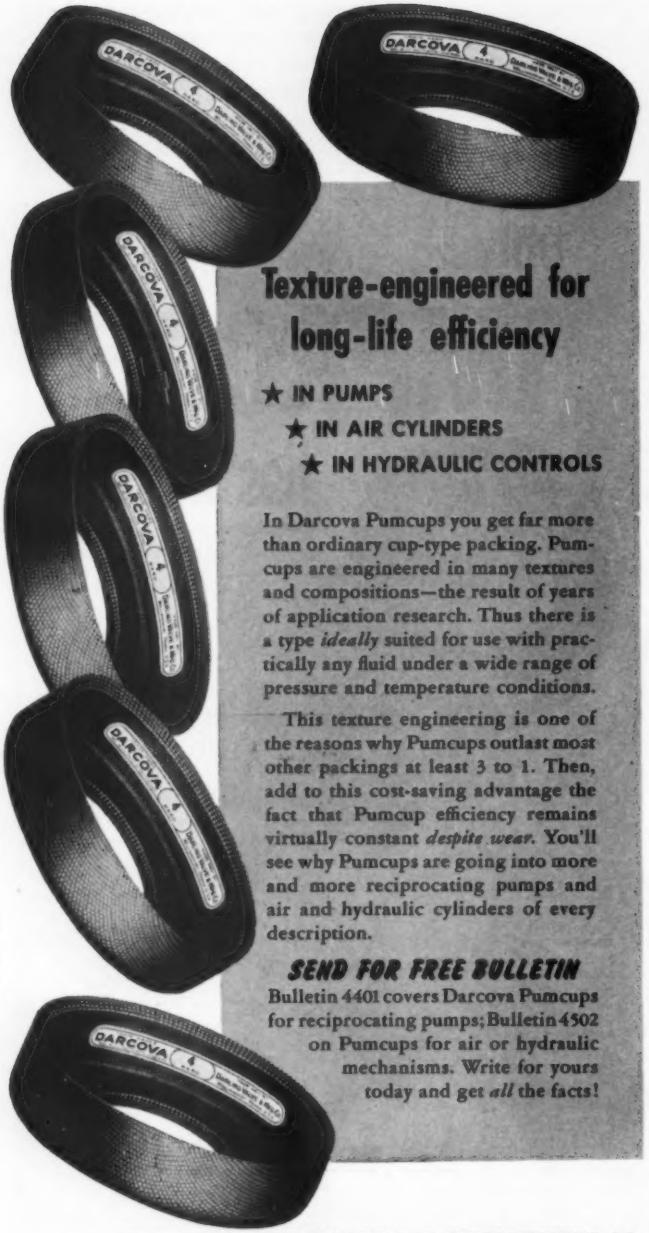
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Texture-engineered for long-life efficiency
★ IN PUMPS
★ IN AIR CYLINDERS
★ IN HYDRAULIC CONTROLS
In Darcova Pumcups you get far more than ordinary cup-type packing. Pumcups are engineered in many textures and compositions—the result of years of application research. Thus there is a type *ideally* suited for use with practically any fluid under a wide range of pressure and temperature conditions.
This texture engineering is one of the reasons why Pumcups outlast most other packings at least 3 to 1. Then, add to this cost-saving advantage the fact that Pumcup efficiency remains virtually constant *despite wear*. You'll see why Pumcups are going into more and more reciprocating pumps and air and hydraulic cylinders of every description.
SEND FOR FREE BULLETIN
Bulletin 4401 covers Darcova Pumcups for reciprocating pumps; Bulletin 4502 on Pumcups for air or hydraulic mechanisms. Write for yours today and get *all* the facts!
DARLING VALVE & MANUFACTURING CO.
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DARCOVA
THE ORIGINAL COMPOSITION CUP
PUMCUPS

NEW PRODUCTS

(Begins on page 114)

of transparent, shatter-resistant Plexiglas ⅛ in. thick and a powerful permanent magnet to which the plastic is swivel mounted. The magnet holds the guard in any desired position on the machine base. The shield protects the operator from flying chips and coolant splash but doesn't obstruct his view.

Recent improvements include the use of a Plexiglas ring surrounding the Alnico slug to keep chips from collecting on the magnet. And the positioning bracket, formerly brass, is now also made of the acrylic plastic to reduce blind spots. The guard is available in sizes from 6 by 8 in. to 12 by 16 in. Dilley Mfg. Co.

Further details on any product are available without cost or obligation. List item numbers on the postage-free cards on pages 35-36, 171-172.

21—STEEL SCRAP BOX has simple dumping device

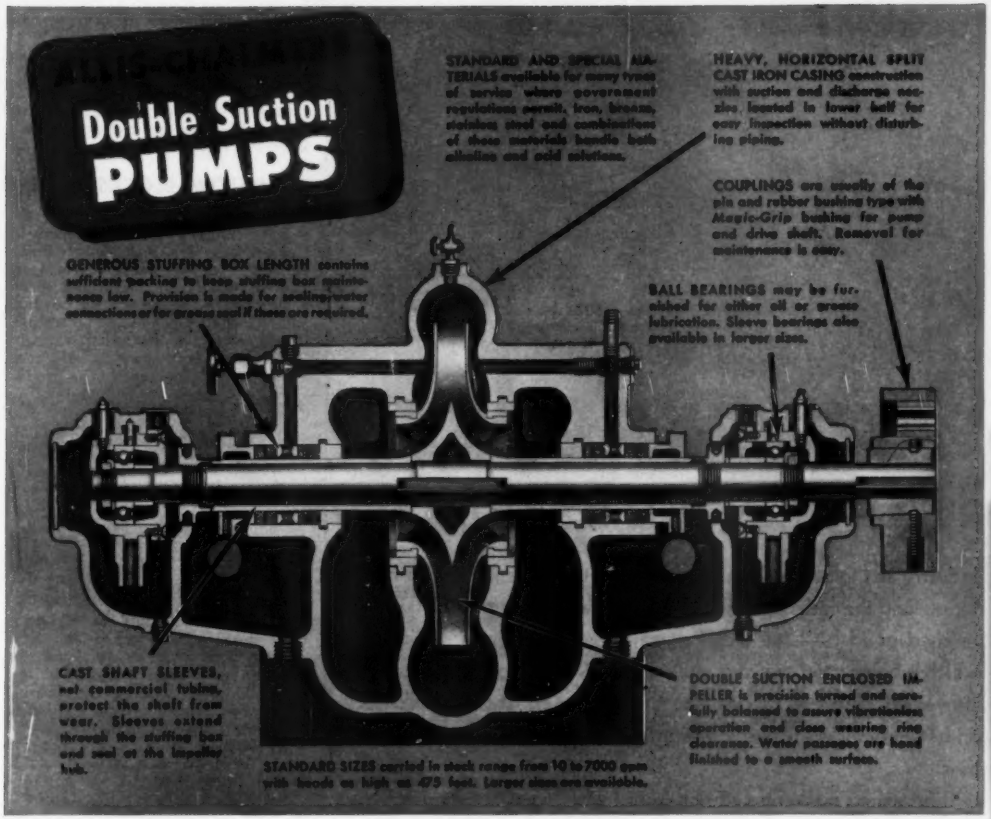
Intended to simplify movement of scrap within the plant, this unit consists of a corrugated steel box and yoke for handling by crane or hoist. The yoke is lowered over the box and lifting eyes of the yoke slip over pivot blocks on the sides of the box. Trip fingers on the yoke are provided to keep the box from slipping.

When the load has been lifted and transported overhead to dumping point, the lanyard is pulled, lifting the fingers off the locking bar, and the box automatically turns over and discharges the load. Standard box size is 36 by 42 by 30 in. deep; capacity is 32 cu ft. Equipment Mfg., Inc.

22—D-C INSTRUMENT serves as both indicator, control

A new contact-making instrument, the model 1087, is a switchboard instrument of core magnet mechanism type. It has two adjustable stationary contacts and a contact on the pointer. The low and high stationary contacts, mounted on indices, "make" or "break" under direct influence of the current in the instrument moving coil. Each index indicates point of operation of its contact and can be independently adjusted over the entire scale range by means of an insulated knob on the front of the instrument. Contact rating is 6 v 0.030 amp d-c non-inductive, maximum.

This d-c instrument serves the function of indication and control when used in conjunction with auxiliary equipment such as small power relays or electronic relay systems. Suggested applications include control of voltage or current levels of standby battery systems or in electro-plating processes; indication and control of speed; other


Double Suction
PUMPS
STANDARD AND SPECIAL MATERIALS available for many types of service where government regulations permit. Iron, bronze, stainless steel and combinations of these materials handle both alkaline and acid solutions.
HEAVY, HORIZONTAL SPLIT CAST IRON CASING construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.
COUPLINGS are usually of the pin and rubber bushing type with Magic-Grip bushing for pump and drive shaft. Removal for maintenance is easy.
GENEROUS STUFFING BOX LENGTH contains sufficient packing to keep stuffing box maintenance low. Provision is made for sealing-water connections or for grease seal if these are required.
BALL BEARINGS may be furnished for either oil or grease lubrication. Sleeve bearings also available in larger sizes.
CAST SHAFT SLEEVES, not commercial tubing, protect the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.
STANDARD SIZES carried in stock range from 10 to 7000 gpm with heads as high as 475 feet. Larger sizes are available.
DOUBLE SUCTION ENCLOSED IMPELLER is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.

Built for LONG LIFE

HEAVY DUTY CONSTRUCTION—no skimping, no corner cutting—is what you can look for in Allis-Chalmers Type S pumps. Extra metal thicknesses, extra strong parts, extra construction features, and extra careful workmanship are always there to give you long life, low maintenance and low cost per gallon pumped.

Every Allis-Chalmers double suction pump is carefully tested on the most modern pump testing equipment in the industry. Each installation is individually engineered by men whose experience in thousands of pump installations will give exactly the right pump for your needs.

Allis-Chalmers can take full responsibility for your pumping operation because Allis-Chalmers can furnish the complete installation — pump, motor, control and drive—all built of coordinated design by one manufacturer. Efficient operation is assured and maintenance costs are kept low.

Whatever your pumping problem, call your nearby Allis-Chalmers Authorized Dealer or District Office. Or write to Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 08B6146. A-3580

Texrope, Vari-Pitch and Magic-Grip are Allis-Chalmers trademarks.

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MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

FREE slide films on pump theory, application and maintenance. Ask your Allis-Chalmers representative.

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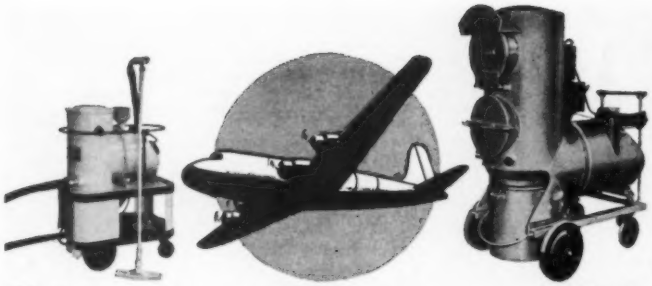


1½ H. P.

A daytime production tool with 100 uses. At night, Spencer machines like these clean thousands of acres of industrial floor space.

7½ H. P.

AIR EXPRESS

RIGHT IN YOUR PLANT

Industry has taken to the air to speed up the movement of raw materials and the tedious work of cleaning, inspection and packing of finished goods. It's the air of powerful vacuum—Spencer Vacuum which is being used daily for more than 100 startling applications for conveying, recovery, waste disposal, automatic dust-free production and sanitation, particularly in the food, chemical and metal industries.

It is moving mountains of rice from freight cars, hot fly ash from pits and sand from the bowels of ships. It is carrying tons of chemicals to the top of a plant for screening, and sorting operations by gravity with a final vacuum pickup from trays on the ground floor. It is picking metal chips out of machined products by the ton and recovering such valuable materials as babbitt, solder, gold, enamel dusts, mercury and solder flux.

For the more delicate manufacturing processes, Spencer Vacuum is speeding bench work, reducing dust conditions and cleaning the finished products. In food it's sanitation, vermin control and conveying.

Any kind of loose material can go "by air" the Spencer way. From heavy metals to loose powders and liquids of all kinds—it makes no difference to Spencer. But it makes a lot of difference to the men who formerly had to do these jobs by hand. More than 100 essential applications are included in Spencer Bulletin No. 144.

437-F

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

NEW PRODUCTS

(Begins on page 114)

functions that can be expressed in terms of voltage or current. Weston Electrical Instrument Corp.

23—PILLOW BLOCKS of high load-carrying capacity

Announced as a joint achievement by Dodge Mfg. Corp. and Timken Roller Bearing Co., these new bearings are said to offer high radial and thrust capacities and the stamina to take heavy shock loads and yet be compact in size and lighter than usual in weight. Self-aligning, with spherical outer race,

they are available in both expansion and non-expansion types and have adapter mounting. Double piston ring seals serve to keep lubricant in and dirt and dust out of the bearing mechanism. The bearings are sealed both on and off the shaft.

While these bearings are not yet ready for delivery, it is planned that they will be carried in stock, and provided in shaft sizes from 2-15/16 to 10 in. They'll be shipped ready to install and are expected to find major applications in crushers, heavy conveyors and other rugged duty machinery. Dodge Manufacturing Corp.

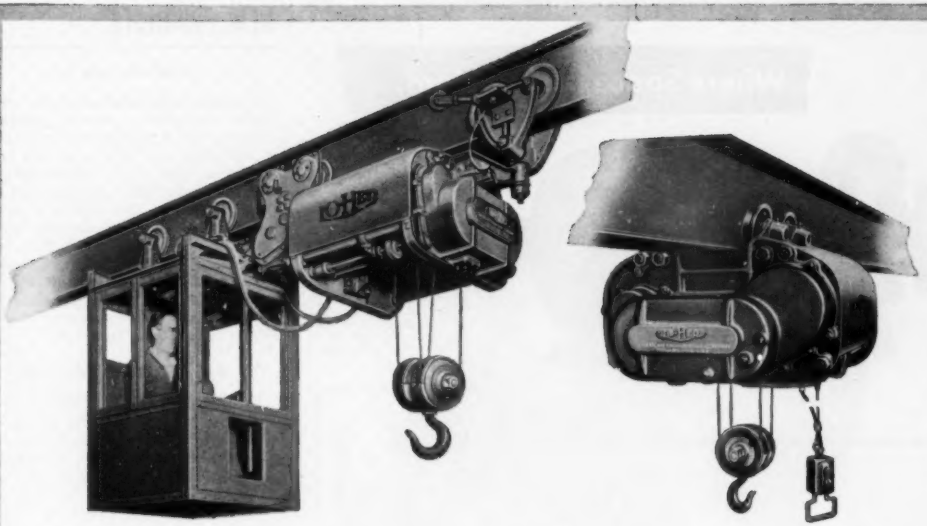
24—INTER-COM SYSTEM is low priced, easy to install

An electronic loud speaker system offering two-way communication at low cost is described as easily installed, easily used and easily serviced. Called the Voice Cast, it consists of compact metal-housed units which plug into outlets from 105 to 125 v, and work on a-c or d-c. To install, you connect the numbered terminals on each station with wire supplied. To use the Voice Cast you simply press a button to talk —and release it to listen.

A two-way system with 50 ft of three-cable wire is listed at less than $35.00. Other equipment available includes extra stations and ten-station selector. Colloid Equipment Co., Inc.

25—MIDGET WRENCH SETS for delicate adjustments

Three additions to this company's line of midget open end wrench sets—Nos. 3200B, 3200D and 3300A — are announced. These contain small obstruction-type and electrical type wrenches



In hoists of capacities up to 12 tons

GET THESE LO-HED EXTRAS!

WHATEVER SIZE HOIST you want up to 12 tons capacity, you also want the time- and money-saving extras that come in Lo-Hed Hoists. Every Lo-Hed, from ½ ton up, has these extras . . . and they're yours at no extra cost.

Take the bottom block of a Lo-Hed Hoist, for example. It's completely shrouded to prevent the possibility of accidents. For further safety, a transformer on all A.C. installations puts 110 volts instead of line voltage at the push button controls. To cut lost time, the Lo-Hed's hook is suspended on an oil-impregnated bearing that prevents tangled lines.

In every feature of design and construction, Lo-Hed Hoists are your assurance of longer working life and lowest materials handling costs. Lo-Heds are made in five suspension types and in a capacity range from 500 to 24,000 lbs. Their "balanced" design gives you low headroom, too, at no premium.

Mail coupon for full information leading to new efficiency and economy.

LO-HED MEANS LOW OVERHEAD

LO-HED CAR PULLER . . . rugged . . . electrically-driven . . . moves railroad cars on private sidings cheaply and safely . . . cuts demurrage costs . . . Saves money *inside* a plant, too; pulls anything within its capacity that can roll or slide . . . up grades, around corners.

AMERICAN ENGINEERING

COMPANY

PHILADELPHIA 25, PENNA.

AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

American Engineering Company
2503 Aramingo Avenue, Philadelphia 25, Pa.

Gentlemen: I am certainly interested in efficiency. Send me full information about ☐ Lo-Hed Hoists . . . ☐ Lo-Hed Car Pullers.

Name_____ Title_____

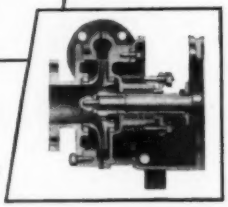
Company_____

Address_____

City_____ Zone____ State_____

Where Space is a Problem...

GOULDS Fig. 3650
Full open top construction permits ready access to gland and stuffing box—particularly desirable when pump is not in a readily accessible position.



Goulds "Close-Cupld" Centrifugal Pump is the Answer

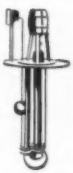
This versatile pump, simple and sturdy in design, is an entirely self-contained unit. Its close-coupled design eliminates coupling and assures perfect alignment with freedom from vibration.

The "Close-Cupld" needs no space-consuming special foundation . . . no unwieldy base plate to support pump and motor. As a result, installation costs are low.

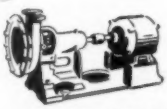
Hundreds of these pumps are doing a wide variety of jobs in factories, steel mills and chemical plants. Interchangeable parts keep inventories low. Available in a wide variety of sizes. Capacities to 2000 G.P.M. Heads to 400 ft. Bulletin 710.1 gives complete specifications. Send for it today. Or call your Goulds representative for the full story.

Other GOULDS Widely Used Throughout Industry

GOULDS Fig. 3750
"Support-Head" centrifugal pump for general and many special applications. Capacities to 4000 G.P.M. Heads to 400 ft.



GOULDS Fig. 3047
Nonclogging impeller of this vertical sump pump will handle water containing solids or fibrous materials.



GOULDS Fig. 3705
Stainless steel pumps for handling acid and alkaline liquors. Capacities up to 600 G.P.M. Heads up to 160 ft.

MEMBER

Goulds PUMPS INC.
Seneca Falls
New York

NEW PRODUCTS

(Begins on page 114)

for use on instruments, electrical equipment, carburetors, timers, generators. Each set has a flexible Vinyl plastic kit.

Set 3200B includes a 4½ in. midget plier and four obstruction-type wrenches with eight opening sizes from 13/64 to ⅜ in. Set 3200D is an expanded master set containing all the tools in No. 3200B, plus four more wrenches. It provides eight opening sizes in both 15 deg and 60 deg head angles. Set 3300A is a professional set containing nine electrical-type wrenches. Plomb Tool Co.

26—WORM-GEAR MOTOR, low speed, right-angle type

According to manufacturer of the Type GW Syncrogear, its design presents features not heretofore available in low speed motors. The Type GW incorporates a cantilever design to protect gear alignment, and gear and motor housing are free from distortion. Mounting stresses are absorbed by a single unit pyramidal base with "spread eagle" feet. It embodies splash lubrication, a hardened and ground worm, leakproof oil seal, asbestos protected windings, self-action braking action.

The motor comes in speed ranges from 20 to 155 rpm and gear ratios to 58:1. Horsepower ranges from ¼ to 3. Both three-phase and single-phase types are available in this new Syncrogear which can be installed horizontally or upright and can be provided with a footless flange mounting. Bulletin 1650 gives further details. U. S. Electrical Motors Inc.

27—TOGGLE SWITCHES for use where space is limited

This series of extremely small toggle switches is designed primarily for use in assemblies where precise switching components must be located in unusually small space. They are developments of company's subminiature switch, the ISMI.

One assembly (the 6AT2) is a single-pole, double-throw assembly with one ISMI switch riveted into a stainless steel toggle bracket. Another (the 6AT3) includes two basic ISMI switches and gives double-pole, double-throw service. Toggle bushings are threaded and fitted with hex nuts for panel mounting. Detents are provided in the toggle mechanism in both actuated and un-actuated positions of the toggle. The ISMI switch assembled in these toggle actuator brackets measures only 25/32 in. long, 23/64 in. high and ¼ in. wide. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

28—FORK LIFT offers several design improvements

Principal features of the improved Yardlift-150 Truck of 15,000-lb capacity are lighter weight, increased horse-

..for clean performance

The motor carrying a Fairbanks-Morse seal is your assurance of long, dependable service . . . the *best* in motor performance.

Why? In totally enclosed, fan-cooled motors, for example, Fairbanks-Morse brings you symmetrical dual-end ventilation, an exclusive feature that speeds cooling, eliminates "hot-spot" dangers . . . complete protection of vital parts from dust, chips and corrosive gases . . . for clean performance in the dirtiest locations.

Whatever the drive problem on your equipment, you'll find the one motor best suited to that application in the complete Fairbanks-Morse line.

When you look for electric motors . . . look for the Fairbanks-Morse seal. For over 120 years it has stood for the finest in manufacturing integrity—to *all* industry. Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • MAGNETOS • DIESEL LOCOMOTIVES AND ENGINES
PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY

FIND OUT HOW YOU CAN PUT PORTABLE HEAT TO WORK FOR YOU!

HEAT-ON-WHEELS
FOR INDUSTRY
THE STORY OF HOW HERMAN NELSON PORTABLE HEATERS CAN SOLVE YOUR EMERGENCY HEATING PROBLEMS
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You can avoid layoffs, speed work in cold areas, provide temporary heat for warehouses with Herman Nelson Portable Heaters. They also provide auxiliary heating for those extra cold days, or during loading or unloading operations, and for scores of other heating and drying jobs. Available in three models; cost as little as $360. Gasoline or electric driven. Capacities up to 450,000 BTU/hr.

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American Air Filter Company, Inc., Moline, Illinois

Please send my free copy of HEAT-ON-WHEELS FOR INDUSTRY.

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City_____ State_____

NEW PRODUCTS

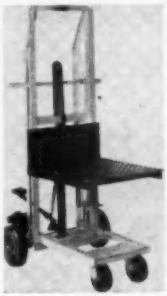
(Begins on page 114)

power and better hydraulic steering. A new power plant develops more horsepower at fewer rpm. Weight reduction of 2300 lb provides increased flotation. Improved hydraulic steering makes operation easier for the driver—in the event of motor stoppage, steering, can be done mechanically. A separate hydraulic system is used for the power steering. Also, a pivoted-type steering axle permits constant wheel contact during travel over uneven surfaces.

Other improvements include increased visibility for driver because of fork bars narrowed vertically and increased opening between upright channels and lift cylinders. This new upright is made from rolled steel sections for greater rigidity and strength. Industrial Truck Div., Clark Equipment Co.

29—HYDRAULIC LIFT is made with large swivel casters

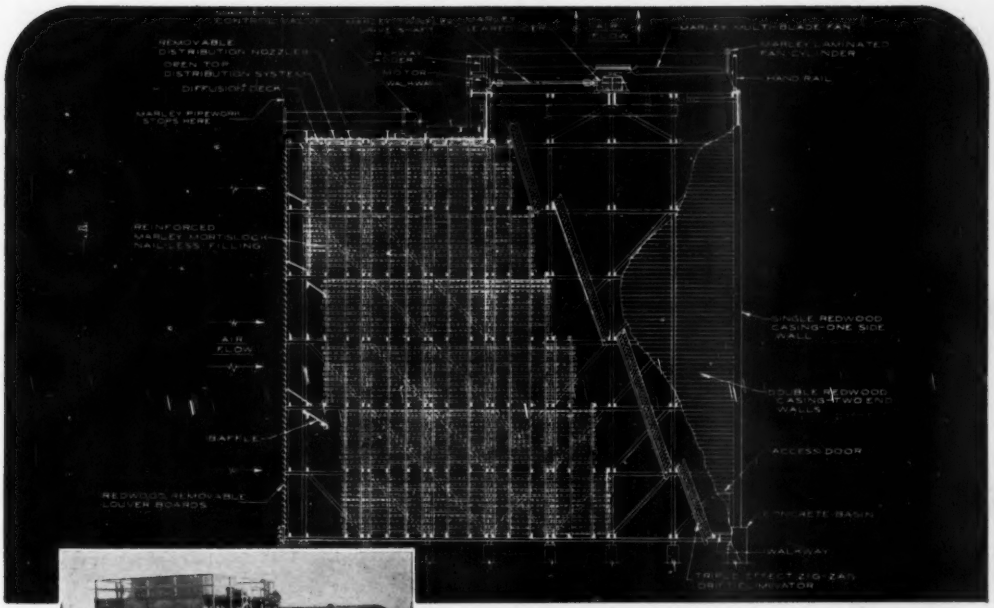
To ease movement of heavy loads over rough floors, the new Model 14S Big Joe is equipped with heavy duty ball bearing 6 in. dia swivel casters designed to take humps, holes or depressions in stride. Aside from slight modifications to accommodate the larger casters, this Model 14S is similar to company's popular Model 14. Loads up to 750 lb can be raised or lowered by "step-on-it" pedal pressure, and solid rubber rear wheels and safety brakes are provided. Big Joe Mfg. Co.

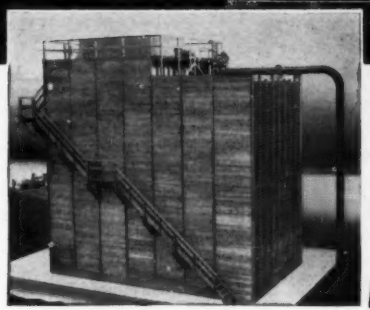


30—BURNER SYSTEM permits centralized safety control

Centralization of combustion safeguard equipment for two to 16 burners can be accomplished with the new Protect-O-Glo system, it is announced. Incorporating the flame rectification combustion safeguard principle, the system features individual flame detecting relays for each burner housed in a single cabinet. These relays are used in conjunction with a photocell flame detector in the case of oil-fired burners or with a flame electrode detector on gas or gas-piloted oil-fired installations. The flame detector and relay circuit act to shut down fuel supply in the event of flame failure at the burner. The cabinet also houses push buttons, signal lights and other component parts.

Three operating options are available: a sequence light-off, a unison light-off, and an independent light-off, in which each burner is individually ignited. Industrial Div., Minneapolis-Honeywell Regulator Co.





for MAXIMUM PERFORMANCE with NARROW PLAN AREA

Engineers who know, choose MARLEY Single-Flow

SINGLE-FLOW COOLING TOWERS adapt Marley patented cross-flow water cooling to confined areas, retaining the features that have built and maintained Marley leadership in industrial water cooling.

Some of these design features, such as the full-height louvered end-wall and patented Mortis-Locked filling are most fully utilized in Single-Flow design. That means greater air volume, more breakup, longer air-water contact—it means wide cooling range and close approach to wet bulb temperature.

Open, visible distribution with its many operational advantages is included in Single-Flow engineering. All mechanical equipment is Marley designed and Marley manufactured for cooling tower use exclusively.

The rugged structural strength and long-tested durability that characterize all Marley design are engineered into every Single-Flow tower. Ease of maintenance and safety of operation are functional features of these high performance towers.

Marley Application Engineers, located in fifty leading cities, will gladly give you further information on Single-Flow cooling towers.

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DOUBLE-FLOW TOWERS
AQUATOWERS
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DRICOOLERS
NATURAL DRAFT TOWERS
CONVENTIONAL TOWERS
SPRAY NOZZLES

MARLEY

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SPECIALLY DESIGNED
for
EASIER INSTALLATION
and
LONGER SERVICE

Fig. 0611, 188M Wedge Gate Valve, Working Pressures: 125 lbs. Steam, 200 lbs. WOG.

KENNEDY JOB-FITTED

Iron-Body Wedge Gate Valves

YOU SAVE TIME AND MONEY all along the line with Kennedy iron-body wedge gate valves because they are JOB-FITTED . . . every valve specially designed and engineered for the job it has to do.

THE WEDGE DISC is a cored casting of thick metal section, reinforced by integrally-cast interior posts and provided with openings to drain in any position.

HEAVY BRONZE DISC RINGS are forced into dovetailed grooves in the disc in a practically inseparable construction.

HIGHER STRENGTH IRON in the body and bonnet is actually 50% stronger than ordinary cast iron . . . and far exceeds A.S.T.M. requirements.

ALL CONTACT SURFACES between moving parts are bronze-to-bronze to assure easy operation.

RUSTPROOFED STEEL BOLTS AND NUTS have ample clearance to prevent distortion. Open-end wrenches may be used . . . no need for special tools. Valves can be repacked under full pressure.

EVERY FEATURE of the valve helps it do the job better . . . gives you a solid guarantee of economy and dependability whenever you install one of these Kennedy Job-Fitted Wedge Gate Valves.

BUY FROM YOUR LOCAL DISTRIBUTOR

WRITE FOR BULLETIN 107

THE KENNEDY
VALVE MFG. CO. • ELMIRA, N.Y.
Est. 1877

VALVES • PIPE FITTINGS • FIRE HYDRANTS

Plant Engineering Department Improves Quality

(Continued from page 77)

return from lift cylinder and holds lift frame in "up" position until index cylinder is in forward position, after which a raise in pressure opens counterbalance valve and pushes lift cylinder forward to lower work.

The flow-control valve is a constant-flow type which provides a constant bleedoff regardless of variations in operating pressures through the control valves. This flow-control valve permits adjusting the speed of the transfer operation to give the work all possible time in the tanks and yet provide smooth motion of the bars.

During the one-minute process time, the solenoid valve is spring-centered to return oil directly to tank. This basic control system also has electrical interlocks which stop the system in case of electrical or hydraulic system malfunction.

The advantages of this new transfer system have been proven in over a year of six-day, three-shift operation. It is light, flexible, simple to control, and easy to maintain. It solved the problem and increased production through the efforts and ingenuity of the plant engineering department.

Refrigeration Systems

(Continued from page 104)

phthalein paper may also be used. The moistened paper will turn pink or bright red depending upon whether the leak is faint or strong.

Freon has a latent heat of evaporation of approximately 69 Btu at 5 F. This value is high in relation to the volume of gas pumped through the refrigeration system. Freon is relatively non-corrosive under ordinary conditions even in the presence of moisture, though it does discolor metals. It is non-toxic, non-inflammable and non-combustible, and hence is considered safe for use where panic hazards prevail.

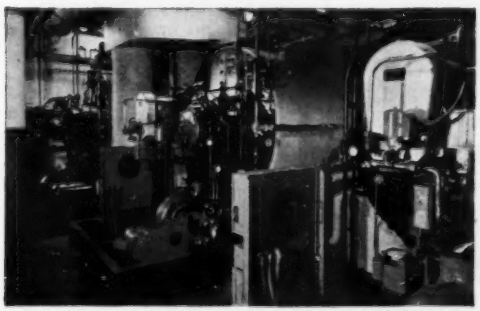
Freon leaks may be detected with

"It's apparent that either you or the girl has a heart murmur."

In this modern newspaper building passersby can see running presses through 11 ft. plate glass windows, located directly behind flag pole in this picture.

WASHINGTON POST BUILDING, Washington, D. C. Albert Kahn Associated Architects and Engineers, Inc. John McShain, Inc. — General Contractor. Standard Engineering Company, Engineers and Contractors.

THE WASHINGTON POST'S new 7-story building is heated by a combination of a hot blast ventilating system for the inside areas and convector radiation along the outside walls. The steam distribution system is divided into two sections, one supplying the fan blast coils at 3 lbs. to 5 lbs. pressure and one supplying the radiation at 3 lbs. to 5 lbs. pressure.



Three Cleaver-Brooks 150 hp., oil-fired, self-contained boilers were easily and quickly installed in low headroom, basement space.

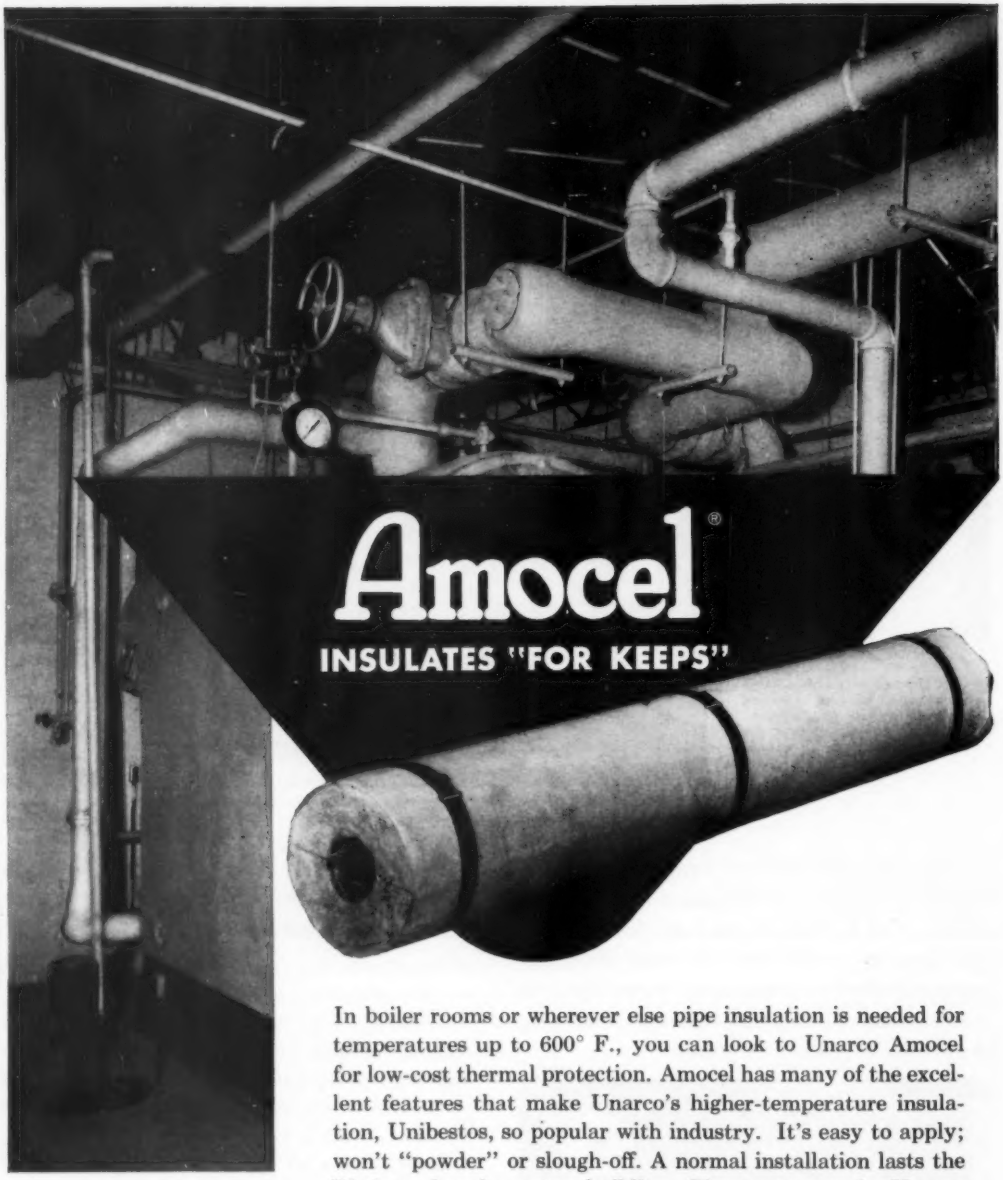
Three Cleaver-Brooks 150 hp. oil-fired, self-contained boilers, installed in the basement location, supply steam for the entire heating system.

Modern Cleaver-Brooks boilers are increasingly specified for heating service. Completely self-contained and compact in design, requiring minimum headroom and floor area, Cleaver-Brooks boilers offer many installation and operating advantages — oil, gas, or combination oil and gas firing — fully automatic — clean — dependable performance — operate at a guaranteed efficiency of 80%. Available in sizes from 15 to 500 hp., 15 to 250 psi.

Write for the latest, fully illustrated Steam Boiler Catalog — Cleaver-Brooks Company, Dept. K, 306 East Keefe Avenue, Milwaukee 12, Wisconsin, U.S.A. *Cable address:* CLEBRO-Milwaukeewis.

Cleaver-Brooks
Originators of Self-Contained
STEAM BOILERS

Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners



In boiler rooms or wherever else pipe insulation is needed for temperatures up to 600° F., you can look to Unarco Amocel for low-cost thermal protection. Amocel has many of the excellent features that make Unarco's higher-temperature insulation, Unibestos, so popular with industry. It's easy to apply; won't "powder" or slough-off. A normal installation lasts the lifetime of equipment or building. Phone your nearby Unarco Warehousing Distributor for Amocel from stock. Or write us for your Distributor's name and free copy of Bulletin 76-109.

UNARCO

UNION ASBESTOS & RUBBER COMPANY

DEPT. J-9, 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

soap bubbles or a halide torch. The halide torch burns alcohol or acetylene gas, depending on the type, and produces a colorless flame. Its design permits its air supply to be received through a rubber hose, which is passed over the suspected leak area. When Freon vapor is present the colorless flame of the torch will change to bright green.

It is very important that the space where the torch is used to detect a leak be well ventilated, since the products of combustion of the resultant flame should not be inhaled.

Methyl chloride has a latent heat of evaporation of approximately 178 Btu. It has no corrosive effect on metal when dry, but in the presence of moisture can cause copper-plating of compressor parts, and in severe cases of moisture, forms a sticky black sludge that affects system working parts. Soap bubbles or a halide torch may be employed to detect methyl chloride leaks.

Carrene No. 2 has a sufficiently high boiling temperature to permit its being handled safely, and with little loss, in open containers when necessary. Its use in centrifugal systems permits the entire refrigerating cycle to be carried out at relatively low pressures. Leaks of Carrene No. 2 may be detected by means of a halide torch or soap bubbles.

Plant Engineering Helps in Design Work

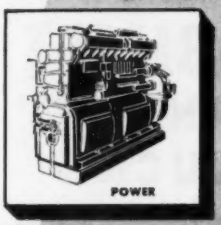
(Continued from page 98)

bugs while the window was still in the drafting stage.

For example one detail indicated the use of a 5/8-in. square mortiser bit which would require two "shots" to make the 1-3/16-in. slot in each piece at each end. Plant engineering suggested that if the function could not be changed, that the hole

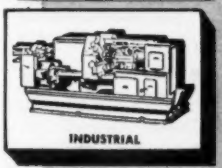
"They didn't give me a badge. I'm chairman-of-the-board."

ROPER
ROTARY PUMPS
The Name of Dependability


POWER

TRANSPORTATION

CONSTRUCTION


INDUSTRIAL

Widely Used in Diversified Industries

Whether your equipment is dependent upon a pump for fuel transfer, coolant work, or hydraulic action, you will maintain greater operating efficiency with the rugged Roper — Series F. This series is built to pump clean liquids of all kinds, and is available in standard or special-built designs in 1 to 300 g.p.m. . . . pressures to 300 p.s.i.

Standard-fitted pumps are self-lubricated by the liquid being pumped . . . helical gears of equal size run smoothly in axial hydraulic balance . . . precision ground and hardened drive shaft . . . 4-port design permits eight optional piping arrangements to cut down installation time and costs. Investigate dependable Roper pumps now and learn how they can help you in new or replacement installations. Send the coupon today!

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ROPER Rotary Pumps

GEO. D. ROPER CORPORATION
149 Blackhawk Park Avenue, Rockford, Illinois

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VISIBILITY UNLIMITED

with

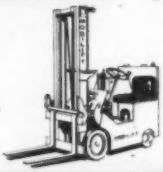
MOBILIFT FORK LIFT TRUCKS

A MOBILIFT operator can see the fork-ends when he picks up a load ...he can see where he's going! There's no groping for the load... no craning around vision-obstructing cylinders. *Unlimited visibility* between Mobil-chain uprights is just ONE reason you get faster, safer, more economical materials handling with Lev-R-Matic Drive MOBILIFTS. Here are other reasons why you can handle materials at less cost with MOBILIFT:

- **Lev-R-Matic PUSH-PULL controls for forward-back movement, lifting and tilting. NO GEARS TO SHIFT.**
- **360° steering wheel makes *zero inner turning radius* possible with stand-up models.**
- **Compact design for maximum maneuverability.**
- **Easy accessibility for servicing and maintenance.**
- **Powerful 3-cylinder gas engine.**

FOR SAFER FASTER MATERIALS HANDLING

STAND-UP MODEL
2000, 2500, 3000, 3500-lb. capacity.
63", 72", 83" Masts
Special Masts to order.
Write for complete specifications.



SIT-DOWN MODEL
2000, 3000-lb. cap.
63", 72", 83" Masts
Special Masts to order.

MOBILIFT Lev-R-Matic DRIVE

MOBILIFT CORPORATION

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be made ½-in. by 1¾-in. and the chain mortiser used. Study by design engineering proved that this could be done with no loss of design function. This allowed 6 pieces to be cut with one shot instead of each piece requiring two shots. That increased the speed on this one operation, 12 times.

On a sill detail of the wood window, one operation was saved when a single cut and a dado cut were reduced to one cut by a dado-cut all the way out to the full thickness of the wood.

These are just three illustrations of how the number of operations were reduced by submitting engineering plans to plant engineering for study prior to adoption.

Conversely, plant engineering often finds that design engineering can take the bugs out of an idea originating in the plant.

Take the case of the vent assembly which rivets the four sides of the vent together simultaneously. One pair of air punches forces the sides together and a second pair with more power follows through to clinch all four pieces at the corners, similar to aircraft riveting.

In redesigning this equipment, plant engineering suggested a support that would be cast. Design engineering found this would be too unwieldy and heavy, and recommended a welded support bracket, saving weight and cost.

"Boss, why is it you know so much and I know so little?"

NOW! Panelboards that adapt to the job ...on the job

BullDog Electri-Centers can be assembled swiftly ... provide foolproof, trip-free automatic protection through Pushmatic circuit breakers. Pushmatics operate with simple PUSH action, need no resetting. Bolt to bus bars so they won't shake loose and require service calls later. Completely interchangeable. Listed by Underwriters'!

New BullDog P2B-P3B Electri-Centers —just 5 in all—fill every possible lighting need up to 42 circuits

Ever order a panelboard, wait weeks for delivery, then find it won't do because requirements have changed?

This can't happen with new BullDog Pushmatic Electri-Center ® Panelboards.

Flexible panel interiors accommodate up to 42 circuits, adapt readily to changes, present and future. Your electrician can install Pushmatic circuit breakers quickly at the job site, remove and replace them whenever requirements change, because they are *individual, fully interchangeable* units.

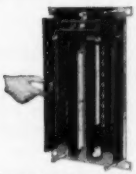
Only 5 basic panel units in all fill any possible lighting need. For the first time, panelboards are simple to order, install ... *really practical* for users to stock.

Get immediate delivery on Electri-Centers from your local BullDog Distributor. For free Bulletin 513, write direct.

LOOK HOW SIMPLE! A PANEL FOR ANY POSSIBLE INSTALLATION UP TO 42 CIRCUITS FROM THESE FEW STANDARDIZED COMPONENTS

1 Just 5 Electri-Center interiors, together with face plates, boxes and fronts...

2 plus selected, interchangeable Pushmatic breakers (15, 20, 30, 40 and 50 amp.) . . .



3 can be assembled right at the job in minutes with only a screwdriver . . .

4 to give you panels that handle any present or future lighting requirement!

JUST 5 ITEMS . . . YOU CAN STOCK THEM YOURSELF

(Single-Phase, 3-wire, Solid Neutral)
1 to 20 circuits, Mains 200 amp.
1 to 40 circuits, Mains 200 amp.

(3-Phase, 4-wire, Solid Neutral)
1 to 21 circuits, Mains 100 amp.
1 to 30 circuits, Mains 100 amp.
1 to 42 circuits, Mains 200 amp.

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IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO
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INDUSTRIAL FILMS

Film for Firemen

AN EDUCATIONAL sound movie, "You Bet Your Life," running time 25 minutes, was prepared in the interest of greater fireman safety.

Graphic scenes depict why respiratory protection is needed to safeguard firefighters against the harmful effects of smoke, gases and vapors. In addition, discussions and demonstrations explain how to put on and use various types of gas masks and breathing apparatus.

This 16 mm, black and white, sound film is available without charge for showing to interested groups. Details on securing the film may be obtained by writing to Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.

Diesel Traction Repair Movie

A SOUND MOTION picture, running time 10 minutes, titled "Make Your Diesel Traction Repairs Stay Repaired," is now available for industrial showing.

The film follows a diesel-electric traction motor through a typical repair shop. Standardized repair procedure, dependable workmanship through quality control, speed and economy are all illustrated as the motor is inspected, repaired and tested.

To make arrangements for showing this film, contact your local Westinghouse representative or write the Westinghouse Electric Corp., Film Division, Box 2099, Pittsburgh 30, Pa.

Film on Vertical Turbine Pumps

A NEW SOUND stripfilm (slides on continuous 3 mm strip), entitled "The Vertical Turbine Pump Story" points out the 4 inherent characteristics of vertical turbine pumps which make them particularly suitable to applications other than the already popular use in deep wells.

Showings will be arranged through Worthington Vertical Turbine Pump Distributors or upon contact with any of the Worthington District Office Managers.

Fire Fighting Film

A NEW, 18 minute, color, sound film "Not Too Hot To Handle," has just been released by Walter Kidde & Co., Inc. The film demonstrates approved fire extinguishing equippent and procedures for Class A, B, and C fires.

During the film, professional technicians use all recognized types of portable extinguishers. Wood, flamable liquid, and electrical blazes are put out in seconds by the application of the proper extinguisher in an approved method. Among the agents demonstrated are water, soda acid, carbon dioxide, dry chemical, foam and vaporizing liquid.

The new film is available nationally through any of Kidde's 6 district offices (Chicago, Detroit, Philadelphia, Dallas, Atlanta, and Los Angeles), or upon request to any Kidde distributor.

Film Helps Prevent Corrosion

ENTITLED "Corrosion in Action," a new, sound color film prepared under the direction of the Corrosion Engineering Section of The International Nickel Co., shows how corrosion causes an annual loss in industry and elsewhere estimated at over six billion dollars.

It also shows how this damage can be avoided or controlled by various means, such as by the selection of corrosion-resistant materials, by the development of new alloys to meet given situations, and by the use of electric currents to provide cathodic protection.

Requests for bookings should be made through Inco's Corrosion Engineering Section, 67 Wall Street, New York 5. N. Y.

HOW YOU CAN GET NEW PIPE EFFICIENCY

FOR 25% OF THE COST OF LAYING NEW PIPE

24" Main before cleaning (C valve 69) — 24" Main after cleaning (C valve 134) — Coater in 24" main — 24" Main after coating

THE PITTSBURGH-ERIC PROCESS FOR RECONDITIONING — 3" TO 24" WATER MAINS IN PLACE

FAST: Up to 1000 feet of pipe can be cleaned and lined in ONE DAY

EASY: Corporation cocks, valves and fittings do not have to be removed. The pipe can be cleaned and lined even though corporation cocks extend through the wall of the pipe.

CONVENIENT: Customers can be supplied with water at all times, if desired, while reconditioning work is going on. Under other conditions, the speed of application keeps inconvenience to users at a minimum.

SAFE: The Pittsburgh-Eric Process leaves the pipe free of contamination. No taste or odor is imparted to the water; a brief flushing period with clear water leaves the pipe ready for use.

EFFICIENT: As the lining is usually applied to a thickness of 1/32 inch and never more than 1/16 inch, little valuable cross-sectional area is lost. The smooth lining, permits a flow coefficient value close to that of the pipe when new.

LOW COST: Depending on the area, the cost of reconditioning by the Pittsburgh-Eric Process is only 25 to 40% of the cost of laying new pipe.

LONG LIVED. The lining material, LECTUMEN, used in the Pittsburgh-Eric Process has high resistance to water and the chemicals used in water. More than ONE MILLION feet of pipe, reconditioned by this process ten or more years ago, is still giving efficient service.

SEND TODAY FOR FURTHER INFORMATION ABOUT THIS MODERN REHABILITATION METHOD

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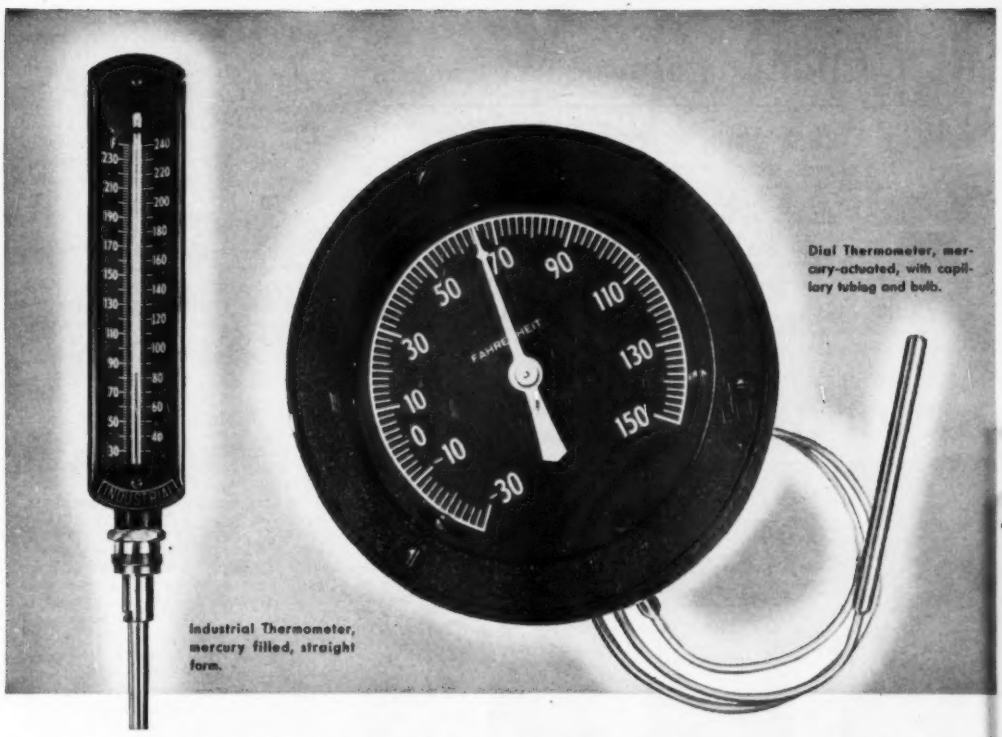
BALTIMORE • BIRMINGHAM • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • DETROIT • NEWARK • PHILADELPHIA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Industrial Thermometer, mercury filled, straight form.

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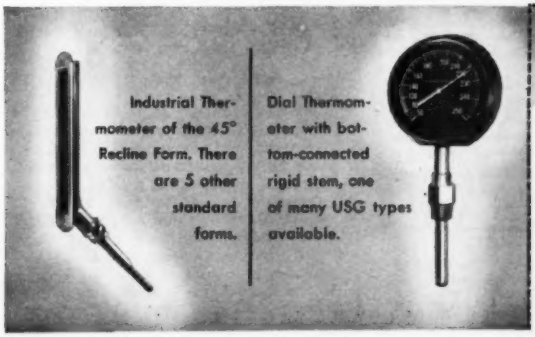
Whenever an industrial temperature has to be taken there is a USG thermometer for the job. You have your choice of the Industrial Type in all sizes, and mounting forms with standard or protected stems; or the Dial Type in a variety of sizes, case styles, mountings, ranges, and connections. Gas, mercury or vapor-actuated.

For typical applications of commercial and approved Navy Standards, covering dimensional information and the use of bushings, flanges, sockets and special tubing, send for Catalogs 100 and 200.

Special thermometers for dough testing, milk testing, fuel gas, candy, solder baths, varnish, canning, vulcanizing and other unusual processes.



Industrial Thermometer of the 45° Recline Form. There are 5 other standard forms.

Dial Thermometer with bottom-connected rigid stem, one of many USG types available.

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NEW BOOKS for the plant engineer's library

Metallurgy—Vital to Industry

METALLURGY FOR ENGINEERS, Casting, Welding, and Working. By John Wulff, Howard F. Taylor and Amos J. Shaler. Size 5½ by 8½ in.; 624 pp, including index and appendix; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $6.75.

THE MAIN OBJECTIVE of this book is to help the reader acquire an adequate understanding of metals so that he may intelligently select and use them. Although the book is written primarily as a textbook for engineering students, it can also serve as a self-teaching book for practicing engineers who graduated in pre-World War II years when metals and their fabrication were less in the academic spotlight than they are today.

The first half of the book explains the concepts and principles that underlie metal processing from ingots to finished articles of commerce. The second half deals with the processes themselves.

Several chapter headings are listed to give an idea of the contents: Crystalline structure and properties of metals; Heat treatment of steel; Electrical and magnetic properties of metals; Corrosion; Casting processes; Powder metallurgy; and various welding processes.

The practicing engineer may refresh in his mind the concepts of metallurgical engineering which may have escaped his memory. To help carry out this objective, the text tries to integrate, with the old, the concepts developed in more recent years.

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Photo courtesy Hamilton Mfg. Corp.

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ZIG-ZAG Continuous Power Conveyors are a patented and exclusive engineering achievement of Richards-Wilcox. You'll find them constantly at work in every type of industry—boosting production, lowering costs, solving man-power problems and raising production line efficiency.

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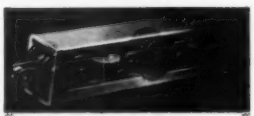

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- Horizontal and vertical units alternate in a continuous chain traveling through special steel tubing.
- Complete flexibility for installation in any plant. Easily installed, easily changeable to conform to plant alterations.
- SAFE—all moving parts are fully enclosed.
- Low first costs. Low Power Factor.
- Standard horizontal or vertical curves —two-foot radius.

For complete details, or a prompt engineering consultation without any obligation, write our nearest office today.

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1880 RICHARDS WILCOX R-W AURORA ILL. U.S.A. 1952
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OVER 72 YEARS

Better Workers Coming Up

Personnel Series. Published by American Management Association, 330 West 42nd St., New York 36, N. Y. Price $1.25 (non-members), $1.00 (members).

OPERATING PROBLEMS OF PERSONNEL ADMINISTRATION, No. 144, 40 pp. This booklet covers papers presented at the AMA conference held the early part of this year. Table of contents includes: Top management and personnel administration; Recent developments in merit rating; a study of employment and retirement problems; What's wrong with employee economic education?; and Motivating employees to work.

PRACTICAL APPROACHES TO SUPERVISORY AND EXECUTIVE DEVELOPMENT, No. 145, 42 pp. Table of contents covers: Progress to date in executive development; How to make your workers want to become foremen; Supervisory Compensation—direct and indirect; and Using supervision to spread economic understanding.

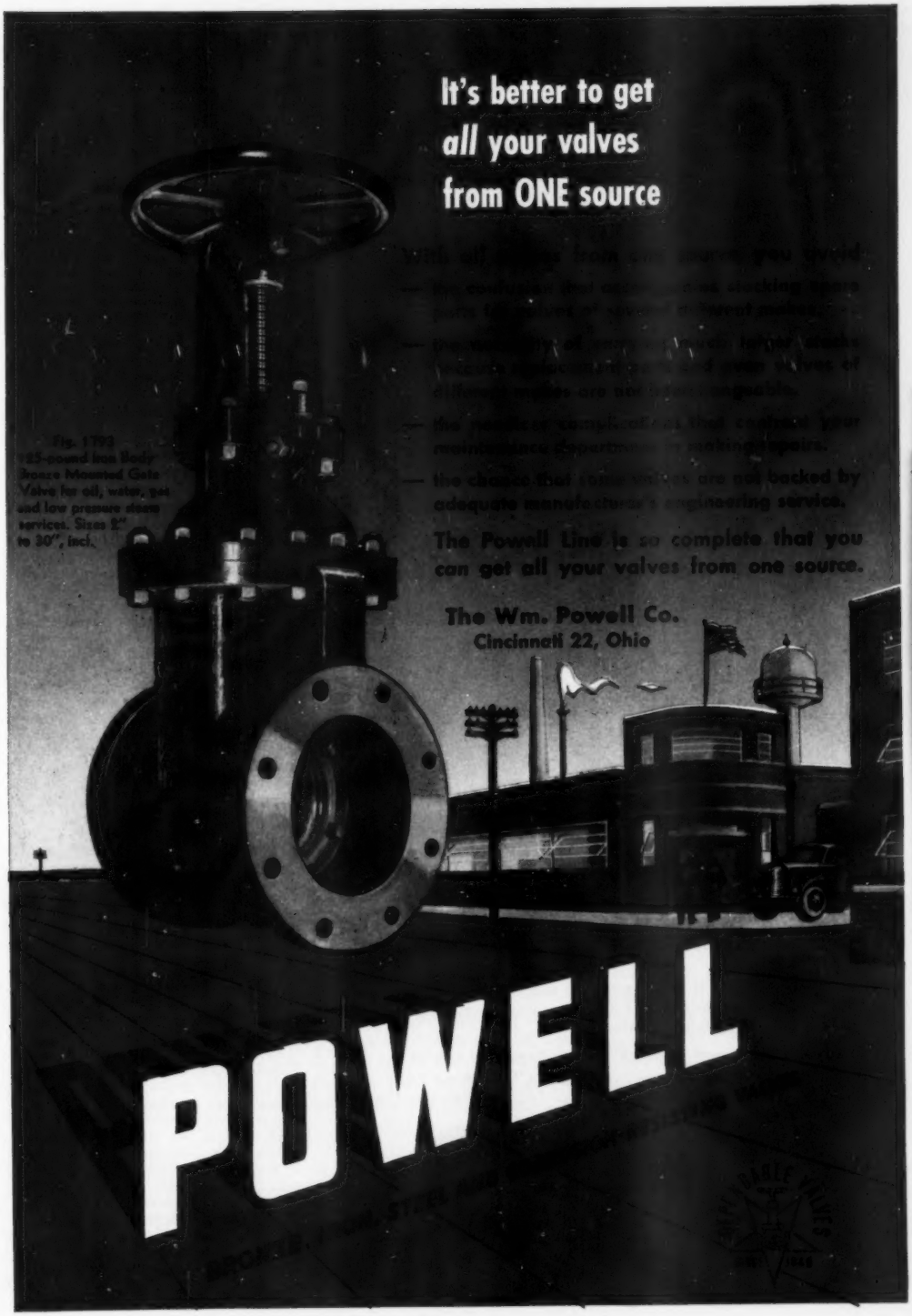
SIGNIFICANT ISSUES IN CURRENT COLLECTIVE BARGAINING, No. 146, 32 pp. This booklet covers a panel session on Significant issues in current collective bargaining, and a talk by Hughston M. McBain on Of Faith and Free Men.

All About Furnaces

THE SCIENCE OF FLAMES AND FURNACES by M. W. Thring. Size 5½ by 9 in.; 416 pp, including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $6.50.

WHAT GOES ON inside a furnace? Because all metals, glass, ceramics, cement, and even building brick are either melted or undergo some physical or chemical change at high temperatures, it is well to know what goes on inside a furnace. The answer to this and many other questions will be found in this book on furnaces.

This book is broken down into seven sections, covering: the function of a furnace; the thermody-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namics of furnace heating; the liberation of heat by combustion; heat transfer; the aerodynamics of hot systems; the science of furnace construction; and the application of the scientific method of furnaces. It might be well to note that the book only deals with furnaces heated by flame and omits any discussion of electrical furnaces.

How to Improve Product Quality

STATISTICAL QUALITY CONTROL by Eugene L. Grant. Second edition; size 6 by 9 in.; 557 pp, including tables and index; illustrated; cloth bound. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. Price $6.50.

STATISTICAL QUALITY CONTROL is a useful tool for the solution of many manufacturing problems that cannot be solved so well by any other known method. And this book explains the statistical techniques that can be widely used in industry to reduce costs and improve product quality.

This second edition contains the following changes: chapters dealing with acceptance sampling by attributes have been expanded and largely rewritten, the chapter dealing with acceptance sampling by variables has been entirely rewritten, treatment of costs aspects of quality decisions has been expanded, and the number of problems has been more than doubled. Answers are now given to about 30 per cent of the problems.

A listing of some of the other chapters will give an idea of the other material covered: Why the Control Chart Works, Some Fundamentals of the Theory of Probability, Some Statistical Aspects of Tolerances, and others.

Generators and Motors

DIRECT-CURRENT MACHINERY by Charles S. Siskind. Size 6 by 9 in.; 319 pp, including index; illustrated; cloth bound. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price $6.00.

THIS BOOK IS concerned with the principles and practices of present-day direct-current generators and motors and their auxiliary equipment. It discusses the fundamental theories of generators and motor operation, the uses of auxiliary and control equipment, the numerous constructions and applications of direct current machines and devices, and the development of many of the special machines now widely used.

The book goes from the dynamo to the armature, generator and motor, treating each with regard to principles and construction, windings, characteristics, performance and other factors.

The problems at the end of each chapter are very helpful. They were selected, for the most part, from actual machine practice, and will as-

KEEP IT LIGHT . . . by G-E Starters
BLINK!
TO HEAR THE SHOP TALK, YOU'D THINK EVERYBODY BUT THE BOSS KNEW ABOUT G-E WATCH DOG STARTERS
CUT IT OUT, FELLERS··· I KEEP TELLING 'EM TO GET WATCH DOG STARTERS···
BLINK!
BLINK!
I CAN'T KEEP STARTED WITH YOU
WHEN IS THE BOSS GOING TO WISE UP? THOSE ORDINARY STARTERS COST HIM PLENTY!
IF IT ISN'T THE LIGHTS BLINKING, IT'S YOU, SPARKY··· HAVEN'T YOU EVER HEARD OF WATCH DOG NO BLINK STARTERS?
I GUESS THE OLD BOY DOESN'T KNOW WATCH DOG STARTERS LAST LOTS LONGER!
HE'S BETTER THAN A VACATION WHEN YOU FIGURE THE TIME WE LOSE AROUND HERE!
YEAH, HE'S LIKE A MEMBER OF THE FAMILY··· HE'S IN HERE SO OFTEN!
STARTERS 1 GROSS

Now is *not* the time to interrupt production to replace blinking fluorescent lamps or burned out starters. General Electric Watch Dog* no-blink starters automatically cut failing lamps out of the circuit when blink begins. And since they don't make repeated attempts to start dead lamps, they last up to 10 times longer. Ballasts last longer, too. So, start now to cut your maintenance costs and help keep production on the beam. Specify General Electric Watch Dog starters as replacements and in new fixtures. Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

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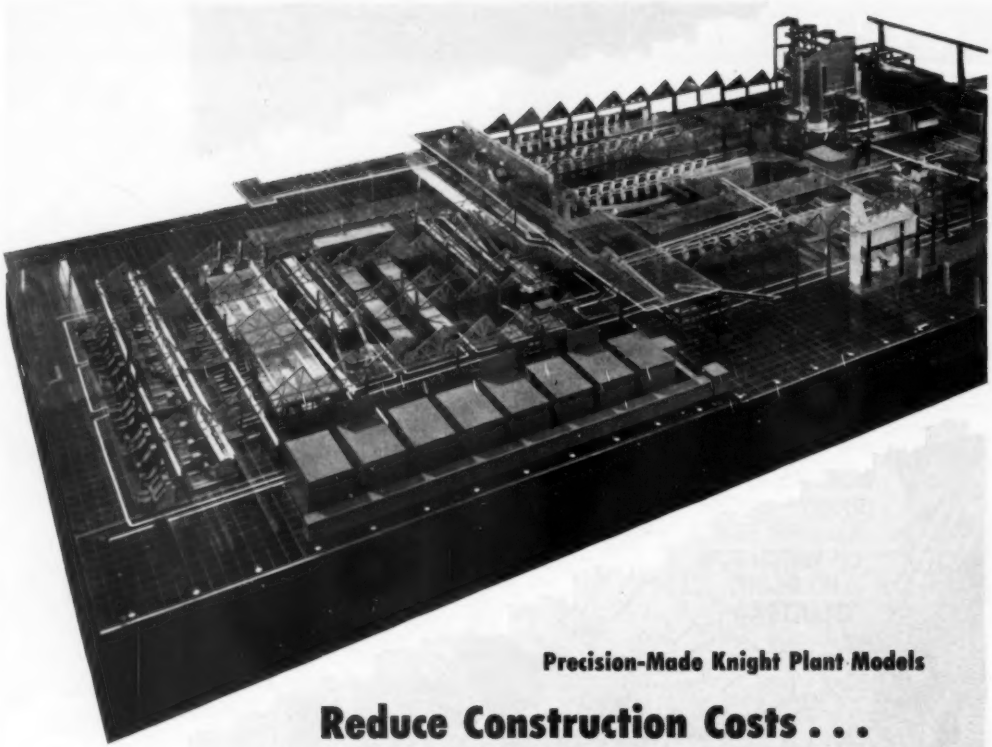

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Precision-scaled Knight Models* have saved many times their own cost in reduced costs of plant construction. And, equally important, these models are of tremendous value in improving quality control.

Knight Models enable Knight engineers and architects to work closely with the client's staff to insure that all details of efficient plant construction, operation, and production methods are accounted for *in advance*. This practical planning saves thousands of dollars on completed projects.

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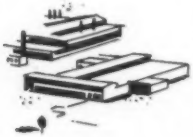

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sist the reader to develop a good sense of judgment with regard to physical dimensions, operating characteristics, and the applications of up-to-date direct-current machines.

Extend Life of Cutting Tools

DESIGN AND USE OF CUTTING TOOLS by Leo J. St. Clair. Size 6 by 9 in.; 437 pp, including index; illustrated; cloth bound. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York. Price $7.00.

SELECTING, DESIGNING, grinding and using machine cutting tools are essential considerations for many industrial operations. This book presents a practical treatment of just how these cutting tools can be used more efficiently and economically with better work the end result.

How to reduce wasteful tool breakage, how to cut down on expensive tool inventory, and how to increase machine output are just a few of the many items discussed. In addition, the functions of various tool angles—side and end relief, angle of clearance, side and back rake—are outlined plus the good and poor qualities of different tool materials.

Book also contains material on grinding tools and suggestions for selecting the best cutting speeds and feeds.

Stress and Strain

REINFORCED CONCRETE MEMBERS, A Study of Combined Bending and Axial Load. Bulletin No. 399. By Eivind Hognestad. Size 6 by 9 in.; 128 pp; illustrated; stiff paper binding. Published by University of Illinois, Urbana, Illinois. Price $1.00.

THIS BULLETIN presents the methods and results of an experimental and analytical investigation on the behavior of reinforced concrete members subjected to combined bending and axial load. The purpose of this report is to describe the observations regarding the basic behavior of such members and to develop mathematical expressions for ultimate loads.

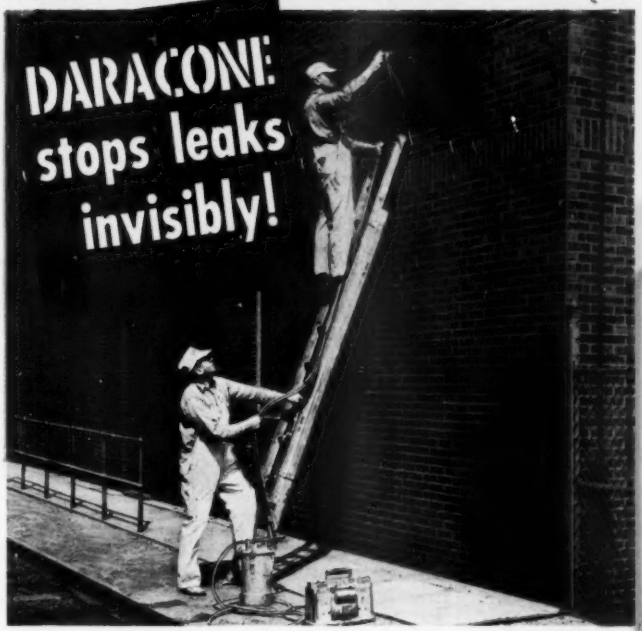
Through this experimentation, an inelastic flexural theory was developed, by means of which the behavior of the test columns may be explained and the measured ultimate loads may be predicted with satisfactory accuracy.

More Production Is Possible

Manufacturing Series. Published by American Management Association, 330 West 42nd St., New York 36, N. Y. Price $1.25 (non-members), $1 (mem.).

ORGANIZED FOR IMPROVED PRODUCTION AND COST CONTROL. This is booklet No. 202 in the manufacturing series. Its 68 pp cover a number of papers discussing the following

NEW PROTECTION against LEAKY WALLS and EFFLORESCENCE!



NOT A "PAINT"! DARACONE is a clear, high-silicone-content water repellent that *economically* STOPS LEAKS in above grade, exterior masonry . . . without affecting appearance or "breathing" qualities of the masonry . . . often avoiding expensive major repairs!

DARACONE *penetrates deeply*, lining pores and hair-line cracks with an insoluble, non-oxidizing, *invisible* film of water-repellent silicone. This effectively stops the capillary action by which water is absorbed. It also ends the major cause of efflorescence. Buildings stay cleaner, too, because dirt and water *roll off* instead of being absorbed.

Fully effective on new or old masonry in reasonably good condition, DARACONE is easily applied, winter or summer. Tests show that DARACONE is *durable* . . . will outlast other materials by a wide margin.

DEWEY and ALMY Chemical Company

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CONSTRUCTION SPECIALTIES DIVISION

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☐ I want to test DARACONE myself. Please send literature and a small sample.

☐ Please have your representative contact me to supply full details about DARACONE.

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1. PRODUCES ALL TYPES—There are E-P low-lift platform and high-lift platform trucks, fork trucks, tractors and mobile cranes—in over 80 sizes and capacities.

2. SUPPLIES *BOTH* MOTIVE POWERS—Electric trucks are usually best, but gas powered Elwell-Parkers are available where preferable.

3. ENGINEERS "*SPECIALS*"—Elwell-Parker has pioneered in designing special trucks or attachments to handle loads of unusual shape—in weights to 80,000 lbs.

Your nearby EP Man can select exactly the *right* truck for *your* particular job—for he is *not restricted* as to type.

WRITE FOR NEW GENERAL CATALOG on the full line. The Elwell-Parker Electric Co., 4178 St. Clair Avenue, Cleveland 3, Ohio.

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Power Industrial Trucks
Since 1906

subjects: Developing cost awareness; Modern management control of factory costs; A material-handling improvement program; Organization of the manufacturing executive's job; and a panel session covering: Organizing the maintenance personnel; Preventive maintenance; Industrial engineering and maintenance; and Maintenance costs.

MOTIVATING THE EMPLOYEE ON TODAY'S PRODUCTION FRONT. Booklet No. 203, 51 pp, covers various papers presented at the AMA conference in April of this year. The table of contents includes: Using new training methods to improve production; A round table discussion on the organization and control of the incentive function; and Collective bargaining and its effect on over-all planning.

Heat Energy

ELEMENTARY HEAT POWER by H. L. Solberg, O. C. Cromer, and A. R. Spalding. Second edition; size 8⅜ by 5½ in.; 624 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $6.50.

THIS BOOK presents background information on heat power as an introduction to advanced study of thermodynamics. The fact that the number of laws and formulas offered in this book is limited, should prove an advantage to the reader. Too many details to remember may only lead to confusion.

The theoretical aspects are linked with the practical. The reader is given an idea of the variety of equipment that uses and is influenced by heat power. Besides students, engineers can use this textbook to give them a wider view of the involving subject.

To use this book more effectively, one should have a knowledge of introductory college chemistry, physics and integral calculus.

Fuels and combustion, steam generation, steam turbines, pumps, the gas turbine power plant, and mechanical refrigeration are some of the 13 sections in this book. The appendix carries steam tables, Mollier diagrams and a table of thermodynamic properties of air.

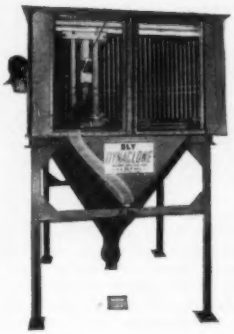
This edition is larger by about 100 pp. A number of problems were revised and more complex ones have been added.

Keep Your Copy Intact

Readers wishing tear sheets of any article appearing in the issue for their personal file may obtain them by indicating the item desired on one of the post cards appearing in this issue. — Editors

NEW CLOTH SCREEN DUST FILTER

provides continuous and uniform suction



After extensive laboratory tests and observance of over 30 units in actual operation for the collection of a large variety of dusts in various industries, the W. W. Sly Manufacturing Co. of Cleveland, Ohio, is now promoting the sale of a cloth type dust filter which offers a number of advantages over existing units, such as: (1) constant uniform suction at the dust source, (2) no mechanical shaking, (3) continual cleaning of the filter bags, and (4) longer bag life.

The usual sheet metal case contains a number of cloth filter bags. A fan creates the suction which draws the dust-laden air into the case. The air passes through the filter bags which retain the dust.

In order to maintain peak efficiency, the dust must be removed from the filter cloth. Here's how it's done (patented): With the filter case under suction, a device which travels back and forth over the open ends of the filter bags has a flexible hose leading to the outside of the filter case. The suction on the case will draw atmospheric air up into the traveling device and in reverse direction through the filter bag which happens to be opposite the device. This reverse flow of air removes the dust from that bag and lets it drop into the hopper under the filter case.

This new dust collector is called the SLY DYNACLONE. The principle of operation of this SLY DYNACLONE is described in Bulletin 101. *Requests for this bulletin and information on application of this design should be addressed to*

The W. W. Sly Manufacturing Co.
4600 Train Avenue
Cleveland 2, Ohio

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Water entering masonry parapet and abutting walls often freezes—causing spalling or open brick joints which lead to leaks and damage to the building.

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The *FREE* Roof Survey Report helps you avoid costly roof failures such as those shown above. It tells exactly what condition your roof is in, helps you plan roofing maintenance.

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The Roof Survey Report is an accurate picture made by a roofing *expert,* the J-M approved Built-Up Roofing Contractor. It covers all critical areas—flashings, decks, roofing felts, parapet walls, skylights, etc. And it will cost you only the trouble of asking for it.

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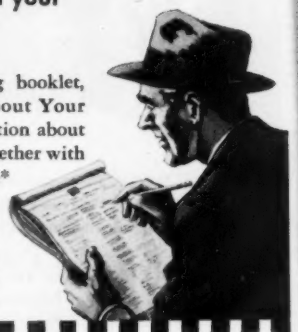
Let us send you the interesting booklet, "Things You Should Know About Your Roof." It gives complete information about the *free* J-M Roof Survey Plan together with the full story of the J-M Flexstone* Asbestos Roof and the Asbestile* Flashing System. Write Johns-Manville, Dept. PE, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.



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12,000 cubic feet of inert gas fill this furnace to help U. S. STEEL produce cleaner, brighter tin plate

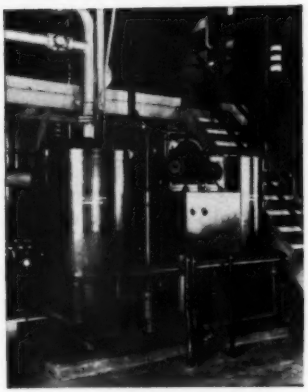
5 Lectrodryers* DRY that gas

Strip is only in this furnace about 105 seconds: 20 seconds in the heating zone, 15 seconds in the holding zone, 15 seconds for slow cooling and then into the rapid cooling zone.

30 tons of tin plate per hour! That's the production pushed through this tower-type annealing furnace at U. S. Steel's Sheet and Tin Mill in Gary. And the strip comes out uniformly annealed, flat, clean and bright.

The DRY protective atmosphere that fills the furnace assures that brightness. Two blowers recirculate this gas, creating considerable turbulence to accelerate heat transfer. Five Lectrodryers keep the gas DRY.

To men having trouble with unwanted moisture in air, gases or organic liquids, Lectrodryer engineers offer their services. Write Pittsburgh Lectrodryer Corporation, 333 32nd Street, Pittsburgh 30, Pennsylvania.



Furnace built by General Electric Company, with the co-operation of Surface Combustion Corporation.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

*REGISTERED TRADEMARK U.S. PAT. OFF.

(Continued from page 36)

plications in abrasive or corrosive service, with sticky materials, for light reflectivity and for temperature shock are outlined. A section on tips for designing metal parts for enameling completes the material. The Erie Enameling Co.

147 Corrosion Resistant Coating—Form S-5251 is on Ricwillite 7100, a cold-setting phenolic resin. This coating is said to form a tough, flexible adhesive film which is tasteless, odorless and non-contaminating; it is suggested for use where baked-on coatings are impractical. Some of these uses are discussed in the bulletin which gives physical properties, resistance to common chemicals and solvents. Ric-Wil Plastic Coating & Mfg. Corp.

VALVES, TRAPS AND PIPING ACCESSORIES

149 Diaphragm Valves—Recently revised Catalog Section 105 offers data on manufacturer's diaphragm control valves. Provides photos, sectional drawings and face-to-face dimensions of the new or completely redesigned items. New valves shown include the Type 87, with bellows sealed stem, for use where even slight leakage of flowing medium might become obnoxious, dangerous or expensive. Another new item is an expanded outlet valve to control flow of gases that require increased volume on release of pressure, or liquids subject to a high flashing. Black, Sivalls & Bryson, Inc.

150 Diaphragm Motor Valves—A double-seated diaphragm valve is described and illustrated in 8-pp Specification Sheet 400-4. This is a wide band proportional control valve. Pertinent data on it—sizes, construction and trim materials, temperature and pressure ratings for various body materials, pressure drops, and mounting dimensions—are given. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

151 Magnetic Pipeline Traps—Bulletin B-203 describes magnetic pipeline traps for sanitary and standard applications. These permanent (non-electric) traps are designed to remove tramp iron from liquid flow lines and afford protection to processing equipment. Typical trap installation data presented. Also included are sections on variables affecting trap size. Eries Mfg. Co.

152 Air Relief Traps—Illustrated Bulletin 2062 gives data on types and installation methods for ball float traps designed to vent air from any liquid under pressure. Pictures some typical uses for the traps, names other applications. Armstrong Machine Works.

153 Replaceable Air Filters—Form 481 is an illustrated data sheet on replaceable transparent bowl-type filters, ¾ and 1 in. pipe sizes, offering improved filtering action, three interchangeable filtering elements, 1 pt water capacity, easier cleaning. Discusses function, applications. Includes dimensions. C. A. Norgren Co.

154 Fabricated Fittings—As a practical help in planning piping and equipment layouts, Bulletin 525 offers specifications and prints on standard fittings for light-weight pipe. Also presents illustrations of special fabrications designed to save time and labor and cut material costs in modernizing piping systems. Naylor Pipe Co.

155 Sanitary Fittings—New threadless sanitary fitting is the subject of 4-pp Catalog 1-152. Tri-Clamp fitting consists of flange type ferrule, gasket and spring clamp secured with snap action toggle. Easy installation and breaking of unions in take-down sanitary lines is emphasized. Tri-Clover Machine Co.

156 Brass Fittings—Illustrated in this bulletin are shut-off valves, SAE flare tube fittings, compression fittings, drain cocks, needle valves, pipe fittings. Includes sizes, prices. Universal Brass Corp.

157 Quick Joining for Pipe—An economical and quickly-used device for joining pipe without threading is introduced in this bulletin. Shows how this joint works, pictures some uses Quik-Joint Mfg. Co.

158 Refrigerant Purger—Bulletin 221 describes a forged steel purger for venting air and other non-condensable gases from refrigerating systems. Discusses air problem, explaining how purger operates, and giving physical data, price. Armstrong Machine Works.

MATERIALS HANDLING

159 Material Handling News—Latest edition of the 12-pp magazine tells background story of lift truck manufacturing and service organization. Invitation and application blanks for service school are included for customer use. Lists materials handling movies, available on loan. Industrial Truck Div., Clark Equipment Co.

160 Material Flow Equipment—Revised 28-pp Catalog GC-53 presents conveying equipment, including power and gravity conveyors, hand trucks and industrial casters, with photos, drawings and specifications. New heavy-duty conveyor is discussed, and a belt centering device is detailed. Tips on selection are featured. The Rapids-Standard Co., Inc.

161 Bag Packaging Machine—Bulletin 60 describes a modern machine which flattens bags, elevates them and loads them on pallets. Stresses savings in warehouse and shipping space afforded, reduced damage in transit, neater bags, production efficiency of this equipment. Explains manufacturer's Power Curve principle of conveying design. Pictures equipment in use, includes plans. Power Curve Conveyor Co.

162 Hydraulic Lift Trucks—Latest line of hydraulic lift trucks is described in 8-pp Bulletin 525. Trucks are hand-operated pallet trucks, with a package hydraulic unit for raising the truck bed under the load. Features listed include hydraulic lifting and lowering, easy travel and stability. Complete specifications are presented for 2500-, 4000- and 6000-lb capacity models. Barrett-Cravens Co.

163 Case Histories on Conveyors—"Owners Report" is a 28-pp booklet filled with illustrated case histories concerning installations of company's package handling conveyors, bulk handling conveyors, coal handling conveyors and special conveyors. Tells what these conveyor installations accomplished in terms of lowered cost and greater efficiency. A. B. Farquhar Co.

164 Fork Lift Trucks—Bulletin 1570, 8 pp, describes the Diesel or gasoline powered PT series of company's lift trucks available in capacities from 2000 to 7500 lb. Partial assembly pictures point out maintenance and control features, and charts show dimensions. The Buda Co.

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165 Hydraulic Lift — This brochure, illustrating and detailing uses of a manually propelled hydraulic lift, outlines the applications and economies of this 1000-lb capacity lift, describes construction features, hydraulic pump operation, and lists specifications. Century Products Co.

166 Paper Clamp Attachment—This new bulletin covers the application and operation of a rotary roll paper clamp for attachment to fork trucks. The roll clamp grips the roll in a pair of hydraulically powered jaws and permits picking up rolls in either the horizontal or vertical position. Bulletin explains how the clamp works and shows how it is adapted to various phases of the paper and boxboard industry. The Elwell-Parker Electric Co.

167 Grabs for Many Industries — Bulletin G-3, 16 pp, pictures and describes complete line of Mansaver Grabs. Application photos show most of the units in action, with sections of the catalog devoted to metalworking, paper, and other industries, unusual applications. Mansaver Industries.

168 Tobacco Plant Handling Methods—Certified Job Study 115 cites savings gained through advanced handling methods in a well-known tobacco plant. Tells of adjustments that cut unloading costs as much as 92 per cent and methods of stacking 1000-lb casks to increase storage capacity 65 per cent. Towmotor Corp.

TOOLS, MACHINE SHOP EQUIPMENT

169 Drum Sanders—Bulletin A-1217 describes company's Cone-Loc drum sanders, illustrating their use and advantages. Includes data on recommended operating speeds, sizes. The Carborundum Co.

170 High-Pressure Cutting Tools—Eight-pp Catalog 152 on company's Guillotine line of portable hydraulic cutting tools is profusely illustrated. Describes six series and 26 models, their uses, capacities, specifications. The Guillotines exert up to 50 tons thrust, cut materials from ⅛ in. steel rod to 3½ in. armored cable. Catalog also lists accessories. Manco Mfg. Co.

171 Improved Saws—"What Magic Pivot Means to You" is a folder presenting the principle and advantages of the "magic pivot," a design in which the pivot point of the saw shoe is as close as possible to the saw shaft and the work. A chart demonstrates the price, weight and depth-of-cut advantages of company's Maxaws with Magic Pivot. Cummins-Chicago Corp.

TAPES

172 Improved Insulating Tape—Data Sheet G-25, 4 pp, lists complete information on modified Silastic R tape. Applications of the tape as Class H insulation are discussed. A description of the tape, including complete physical and electrical properties given. Dow Corning Corp.

173 Electrical Insulating Tape—A self-bonding electrical insulating tape, Bi-Seal, is described in this bulletin. Explains advantages of this plastic tape for wire and cable splicing. Illustrates drop-wire and bridle-wire splicing with this tape; also provides specifications, physical and chemical properties. Bishop Mfg. Corp.

174 Pressure-Sensitive Tapes—Two dozen pressure-sensitive tapes that meet various government specifications are described in this 16-pp illustrated manual. Gives data on tapes for packaging, holding, mending, masking, sealing, mounting, protecting, insulating and splicing jobs. Also lists 11 tapes for the construction and maintenance of electrical and electronic equipment. Minnesota Mining & Mfg. Co.

OTHER EQUIPMENT

175 Insulation for Metal Buildings—Four types of insulation are listed as forming complete line of insulation for any metal building need. The booklet, BLS.A7, describes flexible Aerocor and blanket type insulation, semi-rigid perimeter insulation, and rigid preformed board insulation. Tables presented in the folder provide condensed information on insulation values of each type, together with design data, installation tips. Owens-Corning Fiberglas Corp.

176 Binfeed Stokers—Eight-pp bulletin describes a line of stokers, with emphasis on binfeed type. Installation photos illustrate equipment arrangement, and blueprint reproductions show boiler room layouts. Retorts and accessories are also pictured and described. Plant engineers contemplating new installations, remodeling or conversion jobs should find the drawings provided in this booklet especially helpful. Canton Stoker Corp.

177 Wet Blasting — Six-pp Bulletin 43 shows the application of wet blasting to such work as die and mold finishing, die and mold maintenance, tool finishing and deburring, heat treat scale removal, and surface preparation for plating in applications where close tolerances on work must be maintained. Illustrated. American Wheelabrator & Equipment Corp.

178 Colloidal Graphite Uses—Bulletin 435 is devoted to information on company's colloidal graphite use in surface coatings (dry-film lubrication) and impregnation. Graphite provides lubricating properties in the absence of fluid lubricants, and impregnation increases wear resistance of surfaces such as brake drums, clutches, and grinding wheels. Acheson Colloids Co.

179 Low Pressure Blower — Manufacturer's axial flow, positive displacement blowers are discussed in detail in this 16-pp booklet. Story traces development of design, accents design features, operating characteristics, and applications, lists advantages of axial flow screw principle, and specifications. Read Standard Corp.

180 Iron Castings Terminology—This 36-pp pocket-size glossary of terms explains over 150 technical words relating to ferrous and non-ferrous castings. The booklet is offered to promote greater accord in working out the procurement of satisfactory and improved castings, and should prove useful to the plant engineer who purchases castings. The International Nickel Co., Inc.

181 Production Control System — The combined use of punched-card tabulating equipment, company's Sched-U-Graph and Kardex units for an effective production control system is the subject of Systems **Narrator 801. Explains** how the system works, pictures materials requisition cards, schedule board. Remington Rand.

182 Silicone Rubber—Bulletin CDS-3, 24 pp, entitled "Imagineering with G-E Silicone Rubber," includes information on properties, applications, classes and design specifications of the substance. Unique properties include resistance to temperature extremes, release from sticking, inertness. General Electric Co.

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DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, list item numbers of those wanted on the postage-free cards provided on pages 35-36 and 171-172.

MAINTENANCE

201 Corrosion-Preventive Coatings—This 16-pp illustrated booklet covers a family of products for fighting corrosion. Presents characteristics and application data on hot and cold applied tar base coatings, alkyd resin coatings, chlorinated rubber base coatings, vinyl and phenolic coatings. Includes finder chart. Protective Coatings Div., Pittsburgh Coke & Chemical Co.

202 Protective Paints — Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis, and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for use on wood, metal surfaces. Cellulose Products Dept., Hercules Powder Co.

203 Heavy Duty Paints for Industry—Illustrated with full color paint chips covering the extensive line of industrial paints described, this 30-pp catalog lists aluminum paints, asphalt paints, masonry coatings, high heat paints, enamels, varnishes, interior finishes and other coatings. Discusses each in detail, giving hints on how to apply, coverage, drying times. Includes practical painting guide. Valdura Div., American-Marietta Co.

204 Building Maintenance — Handbook 7 offers 84 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

205 Floor Maintenance—This 12-pp brochure presents a complete and economical program for the care of wood and concrete floors, terrazzo, linoleum and tile. Points discussed include wear resistance, appearance, sanitation, cleanliness, light reflectance, sealers and hardeners, burnishing and buffing. The Tremco Mfg. Co.

206 Roofing Manual—Engineering data on roofing is given in Specifications 50, 30 pp. Covers coal tar pitch roofings, waterproofings, insulations, flashings, protective coatings. Includes illustrated instructions. Tar Products Div., Koppers Co., Inc.

207 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also, special features of company's roofing materials. Johns-Manville.

209 Case Histories on Brushing Problems—The solutions to 12 industrial brushing problems are told in this 32-pp illustrated booklet. Shows how rotary wire brushes, specially selected or engineered for the job, are used to perform abrading, cleaning and finishing jobs. Brush Div., Pittsburgh Plate Glass Co.

210 Vacuum of Many Jobs — Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

211 Floor Maintenance Buyers' Guide—Brief, but practical application details on floor machines and accessories and a wide range of floor cleansers, waxes and other preparations are presented in this illustrated bulletin. Finnell System, Inc.

CONSTRUCTION

212 Building Panel Engineering Data—This 40-pp reference book for use of steel and aluminum panels for walls, decks and roofs, discusses their use, advantages, methods of installation. Covers acoustically treated panels, fire resistance ratings, electrification, acoustic roofs, reinforcing floor forms. Detroit Steel Products Co.

213 Aluminum Building Sheet — Stressing advantages of aluminum for siding and roofing, 12-pp Form AD-247 presents both dimensional data and engineering details covering its use. Provides illustrated suggestions for use of fasteners, flashing details, directions for applying the sheet. Includes tips on painting, welding, storing. Aluminum Co. of America.

214 Standard Screw Products—This 10-pp booklet about "Unbrako" standards tells what they are and the advantages of their use. Gives detailed information on socket head, cap screws, self-locking socket set screws, socket set screw points, flat head socket cap screws, shoulder screws or stripper bolts. Standard Pressed Steel Co.

215 One-Coat Insulation — This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply. Insul-Mastic Corp. of America.

TOOLS

216 Pipe Tool Book—This catalog and data book gives information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

217 For Faster Fastening — Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

218 Tube Working Handbook — Form 369-A is a 32-pp booklet on tube working tools. A section on modern tube working practices covers handling, cutting, flaring, reaming, refacing or fittings, bending, soldering and other operations. Company's line of tools is described. The Imperial Brass Mfg. Co.

220 Pipe Tool Ordering Guide—Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives sizes, prices. Armstrong Bros. Tool. Co.

221 More Holes in a Hurry—Form 2400 is a 36-pp pocket-size booklet which not only provides ordering information on manufacturer's drills, but also gives some excellent tips on how to get the most service from portable electric drills. Discusses motor, drill cord, drill chuck, right and wrong drill bit grindings, drilling of various materials, and drill maintenance. Includes tap drill sizes. Mall Tool Co.

222 Radial Arm Saws—This 12-pp catalog describes company's full line of radial arm saws for industrial, other uses. Complete specifications of four models given. Special accessories are illustrated. Delta Power Tool Div., Rockwell Mfg. Co.

223 What's in a Hammer?—Form 8-46 is a small 16-pp booklet showing what goes into the design and construction of a good hammer. Stanley Tools.

MATERIALS HANDLING

224 Space Saving Fork Trucks—Operational features, engineering details and maintenance advantages of manufacturer's Spacemaster electric fork trucks are described and illustrated in recently published Catalog 32, 20 pp. Trucks covered are from 1000- to 4000-lb capacity. Also included are special purpose attachments. Lewis-Shepard Products Inc.

225 Shovel and Loader — Described in 12 pp Bulletin 1032 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

227 Materials Handling Equipment — Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

229 Portable Bar Racks — This catalog covers company's portable, heavy-duty bar racks for simplified handling and storage of steel shapes, and adapted to use with cranes or trucks. Palmer-Shile Co.

231 Industrial Logistics — Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

233 Manual on Electric Hoists—Catalog H-46, 44 pp, covers monorail and stationary hoists and car pullers. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

234 Electric Hoist Manual—**Catalog 215-B** offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

236 Chain Hoists — Catalog 61, 32 pp, covers a line of chain hoists, telling how to select and use them. Provides an illustrated comparison chart of hoist types, a selector table and discussion of factors to be considered in buying a hoist. Multiple gear chain hoists, screw gear chain hoists, differential chain hoists described separately. Reading Crane & Hoist Corp.

238 Electric Lifters—Medium and heavy-duty electric lifters are described and illustrated in Bulletin LU50. Company's ball bearing hoisting unit is discussed. Economy Engineering Co.

239 Portable Hoists — This bulletin describes a lightweight air hoist in 2000, 1000, 500 and 300-lb capacities. Gives specifications, dimensions. Keller Tool Co.

240 Single Drum Hoist—Sixteen-pp Bulletin 76-X describes single-drum, portable multi-purpose hoists for industrial plants, construction work. Joy Mfg. Co.

241 For Efficient Overhead Handling — Bulletin C-1, 56 pp, pictures overhead equipment for practically all industries. Stresses construction, safety, electrical advantages of trolleys, cranes, track and auxiliaries. Includes layout information. The American MonoRail Co.

242 Data on Tramrail Equipment — Twelve-pp Form 2008F is a recently revised booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

243 Pneumatic Conveying Systems — Four basic types of conveying systems built by this manufacturer are illustrated by photos and sketches of actual installations in 8-pp Bulletin G-1. Covers stationary

THEN . . .
• 50 hp Motor
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• Excessive Belt Wear
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and portable Fuller-Kinyon systems for dry pulverized materials; the Airveyor for dry pulverized, crushed and granular materials; the Airslide for dry, fine materials, and the Fuller-Flexo for dry pulverized materials. Fuller Co.

244 Handbook on Overhead Conveying Systems—Manual A-56 provides 200 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering data. Richards-Wilcox Mfg. Co.

245 Conveyor and Elevator Belts—This 26-pp collection of catalog sections illustrates parts used in construction of company's conveyor and elevator belts. Discusses increased service life and decreased maintenance. The B. F. Goodrich Co.

246 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belt; covers raised edge and flight constructions, chain edge constructions, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

247 Feeders, Conveyors — An excellent presentation of electric vibrating feeders and conveyors is given in 90-pp Catalog 830 covering manufacturer's line of equipment for handling a wide variety of wet and dry materials and including large and small capacity units, for temperatures of -30 to 2000 F. Explains principles of design, operations. The Jeffrey Mfg. Co.

248 Rough Top for Belts—Five designs of rough top surfaces which can be put on company's conveyor belts are pictured in Bulletin A-5148-K. Recommended applications for each design are discussed briefly. Goodyear Tire & Rubber Co.

PUMPS, COMPRESSORS

249 How to Solve Pumping Problems—Form 3060 is a 130-pp manual on selection, use of pumps. Tells type of pump construction best suited for handling 150 liquids. Explains how to determine size, compute suction list and discharge head, determine direction of rotation and size of speed of pulleys or gears. Gives instructions for installing rotary pumps, locating trouble. Geo. D. Roper Corp.

250 Centrifugal Pump Handbooks—Two instruction booklets covering installation, operation and repair of company's single-stage single-suction and multi-stage centrifugal pumps are available. They include illustrated description of such late developments as Magic-Grip couplings, universal joint couplings with Magic-Grip bushings, mechanical seals. Suggest regular inspection procedures and include pages for maintenance records. Also provide handy reference tables explaining how to locate trouble and listing causes and cures. Bulletin 08X7813, 24 pp, covers single-stage pumps; Bulletin 08X7780 48 pp, covers the multi-stage pumps. State choice or both. Allis-Chalmers Mfg. Co.

251 Close-Coupled Pumps—Revised Bulletin 710-1, 12 pp, covers manufacturer's Close-Coupled centrifugal pumps of the single-stage enclosed impeller type. General construction details of these compact, easily installed pumps are designed, illustrated. Goulds Pumps, Inc.

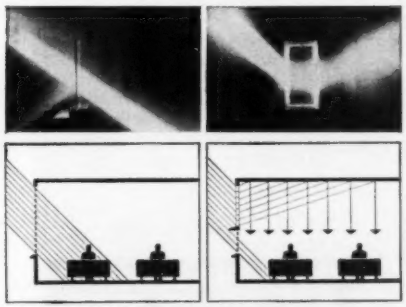
253 Rotary Pumps — Bulletin WQ-50, 8 pp, describes Warren-Quimby Rotex pumps, illustrating design features by both sectional and exterior views. Engineering data, selection charts and dimensions are included. Warren Steam Pump Co., Inc.

254 For Abusive Pumping Jobs—Catalog 4906, 36 pp, covers centrifugal pumps for wide industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types: a horizontal shaft, single-stage side suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings for wet pit use. Nagle Pumps.

255 Rotary Pump Service Manual—Although written for users of company's

Aladdin Industries, Nashville, Tenn.
Architect: Spencer J. Warwick

Daylight Engineering MASTERS
PROBLEMS OF DAYLIGHT CONTROL



Photograph and illustration to the left, above, show what happens when light beams strike an ordinary window. Notice how workers near windows suffer from high contrast while others have inadequate light. To the right, notice how the built-in prisms in Insulux Light Directing Glass Block throw light up, and direct down to task. Result is even, diffused light over all parts of the room.

IN MODERN ENGINEERING, plant lighting—particularly daylighting—is often considered to be almost as important as machinery and methods. Daylight Engineers have found that correct daylighting not only increases employee efficiency and cuts accidents, but reduces overall lighting costs.

One of the widely used ways to make maximum use of daylight is with an Insulux Fenestration System with Insulux Light-Directing Glass Block. The ribs in this block pick up light from angles formerly considered unusable. During all parts of the day, the prisms within the block direct daylight up to ceilings from where it is directed down to working surfaces. Light is uniform, evenly distributed over the entire room.

Insulux Glass Block® panels assure better daylight for occupants and reduced operating costs for owners. Block and installation materials are noncritical.

A Daylight Engineer is ready to bring these benefits to your buildings . . . ready to help you plan an Insulux Fenestration System to meet your exact requirements. Just write Insulux Glass Block Division, Kimble Glass Company, Dept. PE 9, Box 1035, Toledo 1, Ohio.

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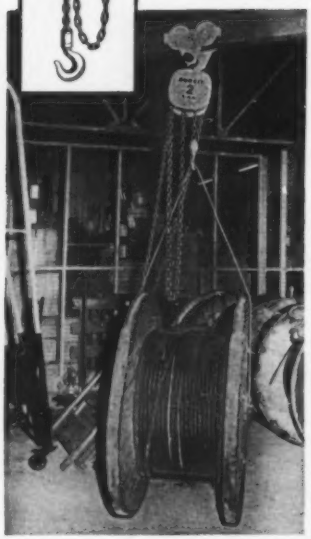
Toledo 1, Ohio

Subsidiary of Owens-Illinois Glass Company

GETS AROUND TO SPEED LIFTING



The ¼-ton 'Budgit' Aluminum Chain Block weighs only 29 lbs. Other sizes — ½, 1, and 2 tons — are also light to carry, hang up and easy to use for spot-lifting anywhere.

The portable 'Budgit' Chain Block works fast. A chain pull of only 65 lbs. lifts 1 ton. Two sets of teeth in each gear carry the load — lifting is smooth. The large, powerful load brake adjusts itself. No ordinary hacksaw can cut the load chain. Every fastening is a strong spline.

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CHAIN BLOCKS

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Builders of "Shaw-Box" Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, and 'American' Industrial Instruments.

own rotary pumps and including a parts list, this little 20-pp booklet contains tips on installation and care applicable to practically all pumps of this type. Covers mounting, pipe connections, suction lines, pipe sizes, strainers, discharge lines, power, relief valves, speeds. Provides pointers on noisy operation, rapid wear, decreased capacity, loss of suction. Viking Pump Co.

256 Compressor Selection Chart — Based on normal applications handling air with atmospheric intake pressure, this chart simplifies selection of proper size compressor, giving quick comparison between discharge pressure pounds per square inch gage and piston displacement cubic feet per minute. The chart shows recommended compressor bore and stroke in inches. Worthington Corp.

PACKINGS

257 Long Wearing Piston Packing — Form 4502, 8 pp, presents composition cups for packing pistons of air and hydraulic cylinders and reciprocating pumps. Engineering information covers properties, textures, temperature and pressure data, sizes. Darling Valve & Mfg. Co.

259 Buyer's Guide on Packings—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons on inside-packed piston pumps. Greene, Tweed & Co.

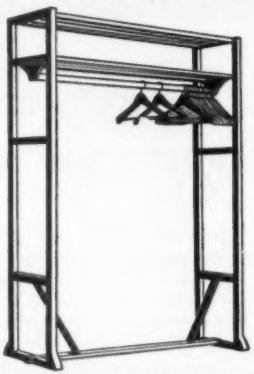
260 Metallic Packing—This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used. A. W. Chesterton Co.

ELECTRICAL, LIGHTING

261 Buyers' Manual on Motors and Control—Fifty-pp Catalog GEC-1009 presents buying information on a carefully selected group of motors, motor starters, control accessories and electronic control. Ratings

Checkerette

Portable Steel Coat Rack



This "knock-down" wardrobe rack answers almost any "wraps" problem, because it can be set up anywhere in a few minutes without nuts, bolts or tools . . . can be disassembled and stored in small space when not in use. It is ideal for installation near point of work, occupies only 1' by 4' floorspace; is ideal for company cafeterias, offices, laboratories and meeting rooms.

It will hold wraps by day and shop coats at night and keep both aired and dry.

Modern, efficient designs, welded steel construction, rigid in use (all members held under tension).

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National Exposition of Power & Mechanical Engineering

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BJ

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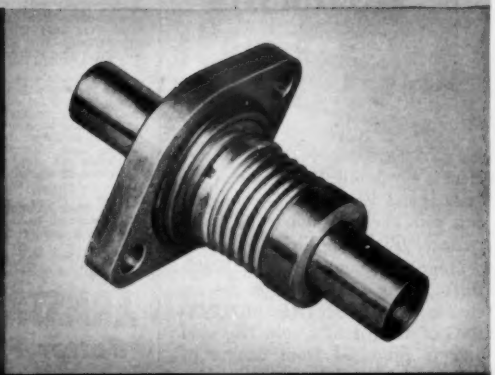
FILE 513
MECHANICAL SEAL

1 PACKING COULDN'T TAKE THIS KILLING COMBINATION OF TOUGH METAL CUTTINGS AND GRINDING WHEEL GRIT...

2 RESULT...THIS IMPORTANT SURFACE GRINDER WAS DOWN EVERY TWO MONTHS FOR COOLANT-PUMP PACKING REPLACEMENT



3 BUT...THIS BJ TYPE L MECHANICAL SEAL SOLVED THE PROBLEM!

4 NOW THIS SAME COOLANT PUMP HAS OPERATED FOR OVER A YEAR AND A HALF WITHOUT ANY LEAKAGE!

FILE FACTS:

- BJ Type L Mechanical Seal replaced packing in pump stuffingbox October 5, 1950, and has operated without any leakage or attention ever since.
- A BJ Bilton pump (1¼"—1½ H.P.—50 gpm) used to pump coolant continuously at full capacity 18 hours a day.
- Machine—surface grinder, used for finish grinding of large castings, hard steel bearings and bronze fittings.

For more detailed information on BJ Mechanical Seals, write for Bulletin #33-10000, Byron Jackson Co., Dept.

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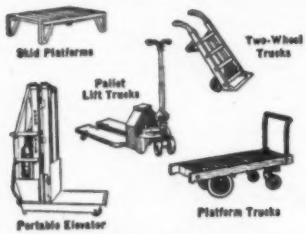
In their capacity range of 2,500 to 10,000 pounds, there's a Weld-Bilt Hydraulic Lift Truck to fit your needs exactly. Write for catalog, details or engineering consultation on the COMPLETE Weld-Bilt Line.



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MATERIALS HANDLING ENGINEERS

304 WATER STREET • WEST BEND, WIS.

listed are those most frequently required. Excellent selection data, dimensions, ratings and prices. General Electric Co.

262 Motor Control—A handy reference book on modern motor controls, comprises 76 pp of condensed information, dimensions and prices of the most popular items in company's line. Covers a-c manual and magnetic across-the-line switches; a-c voltage starters, control relays and contractors; synchronous and high voltage starters; d-c control relays, contractors, starters; drum switches, a-c d-c rheostats, speed regulators, etc. Allen-Bradley Co.

264 Bus Duct Manual—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct for a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

265 Power Distribution Feeders — Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution systems, gives construction, engineering, application data. Trumbull Dept., General Electric Co.

266 Overload Relays — Bulletin 1180-3 is a technical data sheet on overload relays designed to combine advantages of thermal and magnetic tripping characteristics for protecting a-c motors. Pictures design details. The Electric Controller & Mfg. Co.

267 Distribution Duct Engineering Data —Bulletin 427-4 contains 32 pp of data for estimating ventilated duct for feeder, circuits, plug-in duct, and plug-in duct for branch circuits. Includes instructions for laying out distribution duct jobs, and pointers on estimating diagrams, layout symbols. BullDog Electric Products Co.

268 Plug-In Power — Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, mate-

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***Better* PIPE TOOLS**

An easier faster, better way to thread 1" to 2" pipe . . .

WITH POWER!

This light (26 lb.) compact Portable Power Pipe Threader, goes to the job — is *operated with a ½" portable electric drill.* 1 set of High Speed Steel Chasers does all sizes—just move indicator to 1", 1¼", 1½", or 2" marking. Clamp on pipe and apply drill to drive square. The rest is automatic. Operating on anti-friction bearings with automatic lead, it's a *fast*, easy way to get smooth, accurate threads.

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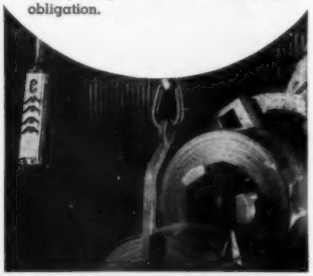
ALL MOTIONS MOTORIZED
To Reduce Costs

• Keeping this guide machine fed with steel strip was always a "touch and go" proposition requiring the attention of several men. To reduce handling costs and speed output, a new idea was tried: a one-ton, single I-Beam Reading Electric Crane, with *all* motions motorized, was custom-built for the job. Now the entire operation is under the thumb of one man—all he does is push the right button on the control pendant.

Modern materials handling is working wonders in reducing production costs these days. Chances are, a Reading Engineer can suggest ways to do the same in your plant if you give him the opportunity to personally analyze your operations. Simply drop us a line—there's no obligation.



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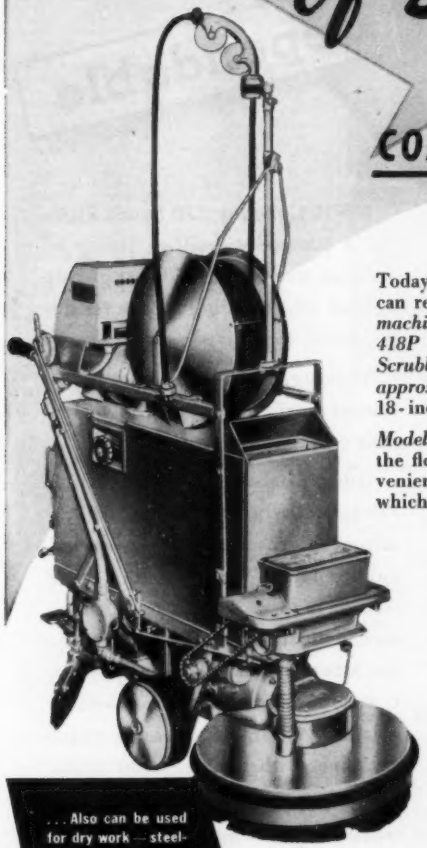

...Also can be used for dry work—steel-wooling, et cetera

Today, even buildings with but 2,000 to 15,000 sq. ft. of floor space can reap the labor-saving, cost-reducing benefits of *combination-machine-scrubbing.* Here's a *Combination Scrubber-Vac, Model 418P* at left, that's specially designed for such buildings. This *Scrubber-Vac,* which has an 18-inch brush ring, cleans floors in *approximately one-third the time* required with a conventional 18-inch machine and separate vac unit.

Model 418P applies the cleanser, scrubs, and picks up (damp-dries the floor) — *all in one operation!* Maintenance men like the convenience of working with this single unit... the thoroughness with which it cleans... and the features that make the machine simple to operate. It's *self-propelled,* and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs efficiently and quietly. (Powder dispenser is optional.) Compactly built, the *418P* also serves advantageously in larger buildings for the care of floors in narrow aisles and congested areas.

Finnell makes *Scrubber-Vac Machines* for small, vast, and intermediate operations, and in *self-powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that you can lease or purchase a *Scrubber-Vac,* and that *there's a Finnell man nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5309 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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Originators of Power Scrubbing and Polishing Machines

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Concord #20 Steam Hose

FLEXIBLE

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Dependable

Illustration shows how special built-in lining of stainless steel inner wire braid assures long life under the most severe operating conditions.
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BWH Concord #20 Steam Hose has a protective built-in lining of stainless steel wire braid that guards against tube swelling . . . assures dependable, long-lived service.

This rugged, braided inner lining assures maximum steam flow . . . permits easy recoupling in the field.

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BWH
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rials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

269 Power Circuit Transformers — By means of comparative wiring diagrams, 12-pp Bulletin 501-15 demonstrates the economy and system simplicity afforded through the use of company's power circuit transformers in handling lighting and low voltage features of these dry type transformers, their use in converting old installations, isolating service. Jefferson Electric Co.

270 Retractile Cords—Bulletin KKG describes and pictures some of the applications for permanently coiled, neoprene jacketed electric cords which expand to 5 times retracted length. Koiled Kords, Inc.

271 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

272 Circuit Breaker Reference Data — Catalog Section 5000 is a collection of more than 30 data sheets providing selection and application information and ordering instructions for company's molded case circuit breakers. Fully illustrated, includes ratings, current carrying capacities, dimensions, prices. I-T-E Circuit Breaker Co.

274 Safety Trolley System — Form 8-10 describes company's insulated "figure-8 bar" system designed for flexible, low cost mobile electrification. Stresses advantages of use for traveling cranes and monorails, easy installation, low maintenance cost. Benbow Mfg. Co.

275 Preventive Maintenance Tips—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls given. Westinghouse Electric Corp.

276 Recommended Lighting Systems — This 16-pp article describes six lighting systems adaptable to most industrial plants. They include systems for illumination levels 20 to 40 ft-c, for levels of 40 to 60 ft-c and for levels of 60 to 100 ft-c, and involve use of filament, fluorescent, and mercury lighting and combinations of these. Explains lighting classifications, and discusses advantages of each type of lighting. Lamp Dept., General Electric Co.

MECHANICAL POWER TRANSMISSION

278 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

279 V-Belt Drive Design Book—Providing 54 pp of engineering data on manufacturer's Bull Dog belts, this catalog gives general drive information as well as simplified methods of selecting V-belt drives, V-flat drives and several types of non-standard drives. Includes selection tables, prices. Boston Woven Hose & Rubber Co.

280 Improved V-Belts — This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

281 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive, application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

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Insulator sheath easily snaps onto conductor bar, permitting quick installation. The sheath is inexpensive, gives full protection.

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Maintenance is minimized by durable construction and simplicity of design. Note that collector shoes in trolley head can be replaced with ease. Change is made without shutting off power.

The system is adapted to curves, switches, turntables, transfers and spur runs. It is custom engineered to your requirements. Make your system safe—at low cost. Write for "Insul-8-Bar" Bulletin S-10.

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INSULATED TROLLEY
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282 Power Drive Handbook — Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

283 Manual on Power Transmission Machinery—Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering data, formulas. Dodge Mfg. Corp.

284 Hydraulic Drive—The Hydro-Sheave, hydraulic power transmission unit, designed for immediate application to electric motors and internal combustion engines in ¾ to 40 hp range is described in illustrated Bulletin 145-B. Tells how unit offers operators of small power units a low cost conversion device as easily applied as a sheave. Twin Disc Clutch Co.

286 Oilless Bearings for Conveyors — Technical Catalog 210, 20 pp, gives detailed information for specifying, installing and use of bearings for screw and roller conveyors, together with operating characteristics. The sectionalized catalog provides tabular data and dimensional drawings to facilitate identification of bearings for replacement. Arguto Oilless Bearing Co.

VENTILATING, DEHUMIDIFYING, AIR CONDITIONING

287 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water, steam heating. Clarage Fan Co.

289 Efficient Dehumidifying—Bulletin 222 is a 32-pp brand new edition of company's popular booklet showing how modern dehumidifying equipment solves moisture problems for industry. Illustrated by 70 photos and diagrams of installations, describes many production, handling and

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FAUCET WASHERS

...a modern laboratory triumph, are compounded from du PONT NEOPRENE (tested up to 800°F.) instead of rubber—so withstand DESTRUCTIVE HEAT common in present-day superheating water systems — that formerly broke down washer's structure.

Built like a tire with fabric re-inforcement they resist the grinding, closing squeeze that SPLIT and MUSH ordinary washers out of shape... causing LEAKS.

Through combining NEOPRENE and FABRIC RE-INFORCEMENT they OUTWEAR ordinary washers 6-to-1 on hot or cold FAUCETS—thus you slash water, fuel and labor costs.

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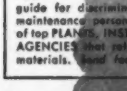

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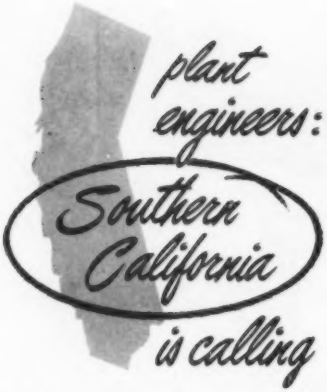

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290 Fans for Tough Exhaust Jobs—This is an 8-pp revised edition of company's catalog on Bifurcator fans, designed for exhausting fumes or gases which are abnormally hot, flammable or explosive. DeBothezat Fans Div., American Machine & Metals, Inc.

292 Fans and Blowers—Illustrated Catalog 21A, 64 pp, gives ordering information on company's fans, blowers, roof ventilators and related products, including application suggestions, ratings, dimensions. Explains principle of curved orifice air-sealing incorporated. Provides directions for installation and operation, maintenance and lubrication. Hartzell Propeller Fan Co.

DUST CONTROL

293 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

294 Dust Collectors — Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk & Blum Mfg. Co.

295 Dust Control Technology — Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

296 Dust Recovery — "Engineered Efficiency in Dust Collection and Recovery,"

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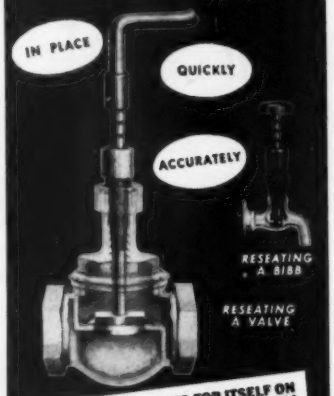

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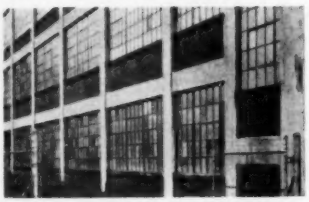

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36 pp, discusses industrial dust recovery from standpoints of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

297 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. Includes tables of exhaust requirements. American Air Filter Co., Inc.

FUEL OILS, LUBRICANTS

299 The Why, What and How of Lubricants—This 20-pp booklet explains and illustrates common tests and terms describing lubricants. Covers viscosity, flash and fire, neutralization, number, penetration, specific gravity, extreme pressure, steam emulsion, corrosion. Tide Water Associated Oil Co.

300 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

301 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equipment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

302 Viscosity of Fluids—The larger significance of viscosity is discussed in Nos. 5 and 6, Vol. 36 of Lubrication, a technical publication. Illustrates simplest conception of streamline flow between two surfaces having relative motion. Shows how viscosity is measured. The Texas Co.

304 Multi-Purpose Grease—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, protects against rust and corrosion. Socony-Vacuum Oil Co.

305 Versatile Industrial Oil — Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equipment, and available in 15 viscosity grades. Discusses six major characteristics of the oil; explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors, hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

WATER TREATING

306 For Conductometric Determination of Solids—A quick and simple method for determining solids content of boiler water or condensate is explained and illustrated in Bulletin 2RE50. Hall Laboratories, Inc.

307 New Data on Zeolite Softeners — Publication 4520-A is a recently revised edition of company's booklet on zeolite water softening. Provides a glossary of terms used in the process, data for laying out a zeolite softening plant, factors governing size of equipment, selection of zeolite materials and discussion of the four stages of operation of a sodium zeolite softener. Cochrane Corp.

VALVES, TRAPS, PIPING AND ACCESSORIES

309 Automatic Valves — Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes sizes, prices, capacity charts, conversion tables. Davis Regulator Co.

310 Valve Maintenance Guide — "Prevent Valve Failure Before It Starts," is a

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Inset shows the heart of the Webster Moderator Control. Variator and Electronic Pressure Control Unit shown here operate in conjunction with the following equipment not shown: Outdoor Thermostat, motor-operated Main Steam Control Valve, and extended tube orifices installed in each Walvector ® unit.

28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

312 Reducing Valve Engineering Data—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straight-line flow, tight closing. A. W. Cash Co.

314 For Threefold Protection—Bulletin 1010B describes company's Air Warden unit for the protection of air-operated equipment. Explains how it is designed to filter air, regulate pressure and lubricate simultaneously. Hannifin Corp.

315 Steam, Air and Gasoline Traps — Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and contai.ing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

316 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure traps sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

317 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

318 Steam Trap Book—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

319 To Stop Those Leaks—Catalog 41-0 offers 28 pp of helpful ordering and application data on pipe repair clamps and saddles, valve and bibb reseaters. Illustrates each product, tells where to use it and how to install it, giving dimensions and prices. M. B. Skinner Co.

320 Handbook on Fittings, Flanges — Catalog wf-1950, 68 pp offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

321 Packless Expansion Joints—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corrufiex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

322 Piping Pointers—This is company's popuar piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

323 Flexible Hose, Bellows — Catalog CMH-123. NPH, 16 pp, describes and gives specifications for manufacturer's line of Flexon bellows and flexible metal hose. Information on metallic bellows of stainless steel, brass, bronze and other alloys is included, covering bellows used in many types of control, regulators and thermostatic devices. A selection guide is pro-

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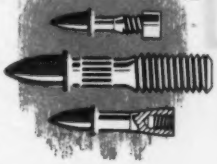

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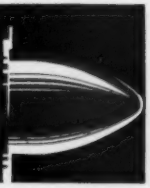

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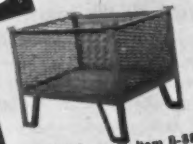

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324 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commerical steel pipe. Tube Turns, Inc.

325 Manifold Discharge Piping Application—Manual 51-B, 34 pp proposes an approach to design of discharge header systems based on partial or complete elimination of back-pressure effects on tied-in safety-relief valves. This principle is claimed to offer great savings in cost of discharge piping. Farris Engineering Corp.

326 Industrial Gaskets—This recently published 50-pp catalog covers an extensive line of gaskets and teflon products, including practically all types of metal, metal-asbestos and special gaskets as well as teflon packing and expansion joints and teflon stock. Includes both engineering and ordering data, application and installation tips. United States Gasket Co.

HEATING, COOLING

328 Heating, Air Conditioning Book—Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

329 What Unit Heaters Can Do—Featuring many photos showing how unit heaters are being used to provide heating comfort, cut fuel costs, provide economical air circulation, 8-pp Bulletin 149-A discusses advantages of these heaters and includes performance data. Modine Mfg. Co.

330 Propeller Fan Unit Heaters—Twelve-pp Bulletin 1301 shows how unit heaters can solve many a space heating problem. Both horizontal discharge and vertical discharge units are covered, and outstanding construction features detailed. Suggestions on where to place heaters provided, also basic capacity data. C. A. Dunham Co.

331 Industrial Dry Coolers—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium-size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling natural gas, lube oils, fluids of refining stages. The Marley Co., Inc.

VIBRATION, SOUND CONTROL

332 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discussing advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended and alternate methods of isolation. The Korfund Co., Inc.

333 Sound Facts—This little folder gives the ABC's of noise. Tells what it is, how it is measured, and how company's sound control installations work to reduce noise levels to comfort range. Illustrates and describes briefly: machinery enclosures; sound barriers, traps; sound proof rooms. Industrial Sound Control, Inc.

334 Simplified Isolation — A simplified method of machine isolation which utilizes pads and cement is described in this small folder. Explains how it reduces maintenance cost. The Felters Co.

INSULATION

335 Heat Insulation—This 8-pp booklet on hydrous calcium silicate insulation is illustrated with graphs, tables and drawings showing numerous ways this insulation is used in industrial and commercial projects for temperatures up to 1200 F. Lists wide selection of shapes and sizes. Kaylo Div., Owens-Illinois Glass Co.

336 Pipe Insulation—Form 76-102 is a small folder stressing efficiency and

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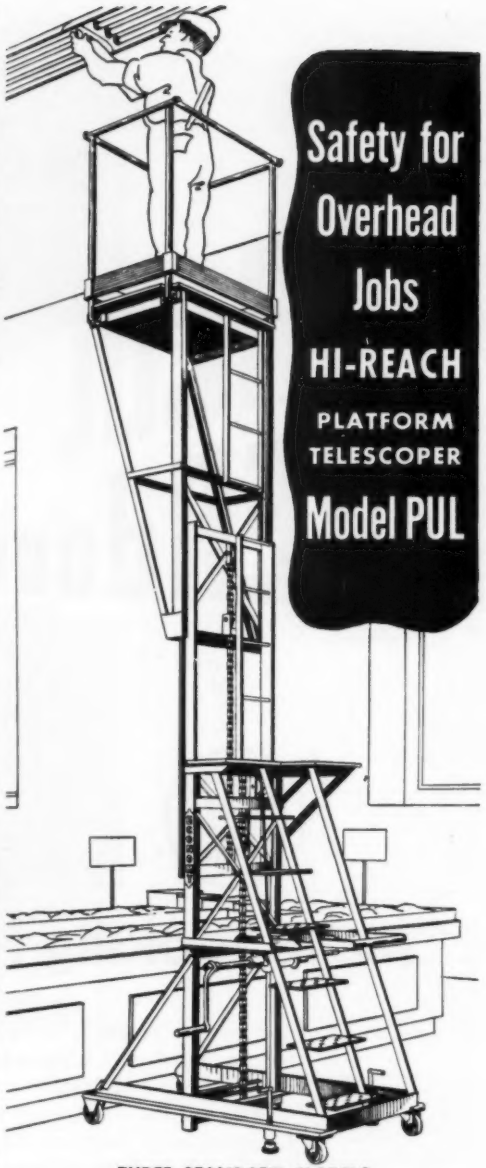

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economy of Amocel, a lightweight asbestos pipe insulation for temperatures to 650 F. Discusses its low thermal conductivity, high mechanical strength in relation to its weight. Union Asbestos & Rubber Co.

INSTRUMENTS, CONTROLS

337 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature, pressure-low water, liquid level, bottles; transformer-relays, valves. The Mercoid Corp.

338 Gages for Many Jobs—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

339 Fundamentals of Instrumentation—Booklet 80-2, just released, offers 126 pp of information on instrumentation in industry. Separate sections are devoted to the fundamentals of measurement and control, measurement of process variables, remote transmission of measurements, automatic controllers, power units and final control elements, control systems and panelboards. Illustrated. Available to qualified plant engineers. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

340 For Liquids Worth Storing—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

341 Heating-Air Conditioning Controls—A complete and informative ordering book for thermostats, motor-operated valves and accessories for heating, ventilating and air conditioning applications is offered in 48-pp Catalog F-1753-3. Compiled to aid in selection of control equipment to meet rigid specifications. Barber-Colman Co.

342 For Combining Control Signals—The improved design of company's Ratio Totalizer is described and pictured in color in 8-pp Bulletin 5452. This simplified, versatile mechanism is a pneumatically operated control for combining input control pressures and spring forces, and producing an output control pressure based on functions of the input control signals. Hagan Corp.

343 Time Saving Volt-Ammeter—Manual 110, 16 pp, "How to Make Your Job Easier with the Amprobe," describes the handiness of this pocket-size volt-ammeter in installing, repairing, servicing electrical equipment. Pyramid Instrument Corp.

344 Electrical Instruments — A line of instruments for production testing, plant maintenance and service is shown in 16-pp Bulletin A-16-B. Among these are a-c clamp volt ammeters and a-c clamp ammeters, circuit testers, analyzers, mutual conductance tubechecker, pocket-size meters. Weston Electrical Instrument Corp.

SAFETY, SANITATION

345 Dry Chemical Extinguishers — New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

346 Washroom Layouts — Sixteen blueprint drawings of industrial and institutional washroom layouts are shown in this 12-pp booklet. Provides a general discussion of washroom planning, also roughing-in data. Bradley Washfountain Co.

OTHER EQUIPMENT

347 Magnetic Selection Guide — Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets serves as handy guide to the selection of magnets. Dings Magnetic Separator Co.

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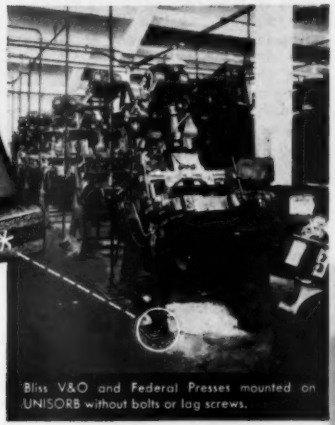

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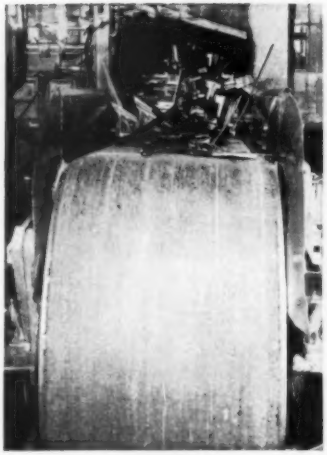

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C-B Systems in every process industry are registering similar savings for owners. By returning condensate to boilers at high temperature and high pressure, and eliminating entrained air from jackets, coils, and piping, the C-B saves valuable heat units—keeps process equipment at consistent high temperatures. Steam costs are reduced. Higher temperatures boost production. Cochrane Publication 3250 gives complete information on the C-B System. Write for your copy today. COCHRANE CORPORATION, 3126 N. 17th Street, Philadelphia 32, Pa.

COCHRANE
C-B SYSTEM OF CONDENSATE DRAINAGE CONTROL

348 To Keep Wire Rope at Work—Form 3547 is an 82-pp handbook titled "Here's How To Keep Your Wire Rope Working," and filled with practical tips on care and use of wire rope. Tells how wire rope is constructed, what types are suited to various jobs, how to install it. Covers such subjects as abrasion, lubrication, avoiding kinks, alignment of sheaves, winding on drums, bending fatigue, wire breaks, when to discard a wire rope. Wire Rope Divs., American Chain & Cable Co., Inc.

349 Re-Circulation Steam Generator — Here's a 6-pp folder introducing a controlled re-circulation steam generator, describing its developments and uses. Combustion Engineering-Superheater, Inc.

350 Spreader Stokers — Dumping-grate and traveling-grate spreader stokers are described as to design and performance and illustrated in color in 16-pp Bulletin SB-42. Typical applications of both types are presented. Erie City Iron Works.

351 Water, Waste Water Systems — An engineering and construction service for greater efficiency in industrial sewer systems and water systems is described in this bulletin. Discusses facilities for surveying requirements, testing, designing and construction. Pittsburgh Pipe Cleaner Co.

352 Neoprene Goes to Work — Eight-pp Bulletin A-18 discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

353 Plumbing and Heating Supplies—Edition F is a 118-pp catalog listing over 2500 repair parts and precision tools for maintenance of all types of plumbing fixtures. Fully illustrated, includes plumbing fixtures. J. A. Sexauer Mfg. Co., Inc.

354 Production Control Systems, Procedures—Publication X-1268, 56 pp, details a method of materials control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production line. Illustrated with typical forms. Remington Rand Inc.

355 How Much for Steam — Here's a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb. using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

356 Good Place for Wraps — Manufacturer's Lockerettes, modern scientific locker units combining best features of both lockers and coat racks, are described and pictured in Bulletin 658. Vogel-Peterson Co.

357 Metal Spraying Gun — Company's Type 4E gun for high-speed spraying with all metals is described in Bulletin 94. A cutaway drawing shows construction features of the gun which is designed for tool-post mounting or hand operation. Metallizing Engineering Co., Inc.

358 Steel Unions — This catalog sheet describes and pictures several types of steel unions, telling applications of each and listing sizes, prices. Clayton Mark & Co.

359 Brakes and Brake Motors—Construction advantages of company's brakes are featured in illustrated Bulletin SL-610-1 on brakes and brake motors. Dimensions, mechanical and electrical characteristics. Crocker-Wheeler Div., Elliott Co.

360 Putting Air to Work—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt—this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

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Main Oil Buff conveyor belting is not affected by any kind of oil, and is highly resistant to abrasion . . . so it's ideal for conveying metal tote pans, wooden boxes and crates, rough machine parts, oily metal stampings and for use on conveyors with diverter arms.

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Black & Decker Plant Has Built-In Flexibility

THE NEW PLANT of Black and Decker at Hampstead, Md., was built with an eye to flexibility and possible expansion. Recognizing the limitations of their suburban site in Towson, the management has made provisions for the ultimate expansion of this new plant to a total of a million square feet, all of which would be on one floor.

Final assembly of large tools starts at this point. Unit area platforms have been installed in the trusses throughout the building to accommodate mechanical equipment. Lighting here will be at 50 ft-c level when installation is completed

Traffic corridors and employee service facilities provided on the lower level, in the initial unit, would be extended to keep the production level permanently free of obstructions as the plant grows. This aspect of the new plant, which has been designed and built by The Austin Co., will preclude the necessity for multi-level operation which has complicated the utilization of the Towson site where the company now has a total of 276,000 sq ft of production space.

Adoption of wide column spacing, 40 by 60 ft, with 15-ft vertical clearance and the unit installation of heating, ventilating and power distribution equipment insures maximum adaptability of the floor space to meet any future operating requirements. The unit-area platforms have been equipped with convertible air handling units with present provision for mechanical ventilation, but which can be readily supplemented to include conditioning of

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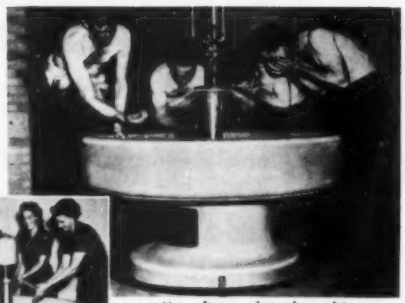
For All Employees, Men and Women

Bradley Full Circle Washfountains serve 8 to 10 persons simultaneously — each with clean running water from central sprayhead. The standard in sanitary fixtures for over 30 years. With foot-control, water flow is cut off automatically when washers leave.



Men often wash to the waist.

NO FAUCETS TO TOUCH

Sanitary Bradleys provide maximum facilities in minimum space and reduce piping connections. With foot-control there are no contacts with faucets so no chance of transmitting germs. Send for complete Catalog 5204. BRADLEY WASHFOUNTAIN CO., 2371 W. Michigan Street, Milwaukee 1, Wisconsin.

BRADLEY DUO-WASHFOUNTAINS
Ideal for executive and clerical washrooms —in cafeterias, laboratories, work shops.

BRADLEY washfountains

Distributed through Plumbing Wholesalers

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THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS

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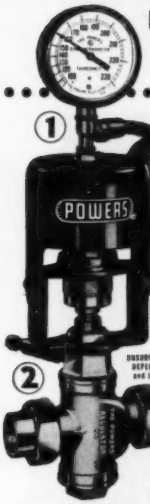

No. 11 Self-Acting TEMPERATURE INDICATING REGULATOR

← *Other dials available*

SAVES LABOR—Stops Losses caused by over-heating

Automatically controls temperature of liquids or air at any point desired. Needs no compressed air or electricity for its operation.

3 Plus Values give you more for your money: 1) Easy to read 4" dial thermometer shows temperature of liquid or air being controlled, makes it easy to adjust regulator for proper temperature. 2) Has valve stem lubricator. 3) OVER-heat protection.

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HEAT EXCHANGER TUBE ENDS

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Flowrites—made of the same metal as the tubes—are available in any length, diameter or gauge. They are easy to install and remove by unskilled help. When Flowrites themselves become worn (*instead* of the tubes!), just pull them out and install new, longer Flowrites.

Get the facts from the 8-page Flowrite "proof" booklet, available upon request.

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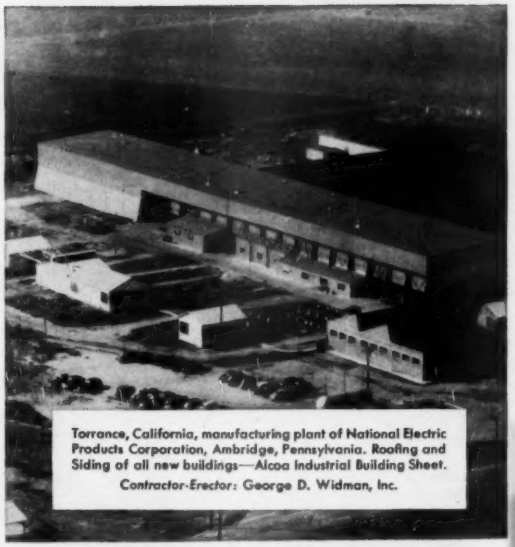

Torrance, California, manufacturing plant of National Electric Products Corporation, Ambridge, Pennsylvania. Roofing and Siding of all new buildings—Alcoa Industrial Building Sheet.

Contractor-Erector: George D. Widman, Inc.

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Here's how National Electric Products Corporation put Alcoa Building Sheet to work. When facilities had to be expanded . . . fast—secondary buildings were erected to house the generators, pumps and compressors, freeing the main structure for additional electroplating and processing equipment. All the additions were built faster...built stronger—with Alcoa *Aluminum* Building Sheet.

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Widths: Roofing, 35 inches—Siding, 33¾ inches (32 inch coverage).

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ALCOA

INDUSTRIAL BUILDING SHEET

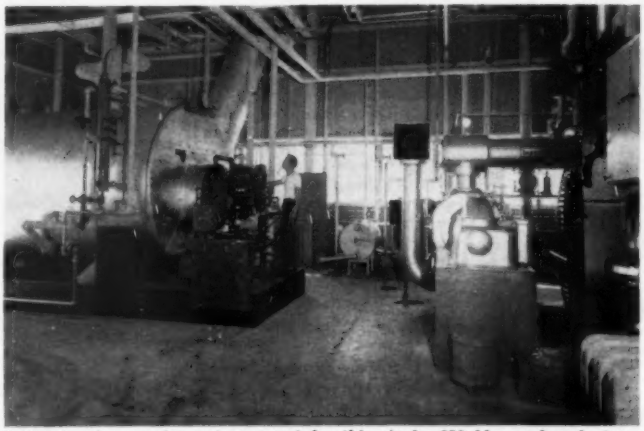
the air. The equipment platforms were raised into position in the trusses with all of the principal air handling units already in place.

Though the building includes commercial projected sash 4 ft high, the light that counts is furnished by 30 rows of fluorescent fixtures mounted in channels 12 ft on centers running east and west. The building is presently divided into two areas: the south 240 ft are designated manufacturing area and are covered by continuous strips of light to give 50 ft-c; the north 120 ft are storage and service areas and are wired for continuous lighting but have only a portion of the bulbs, ballasts and starters installed to give a light level of 30 ft-c. At any time, components can be mounted in the fixtures in this end of the building to raise the level to 50 ft-c.

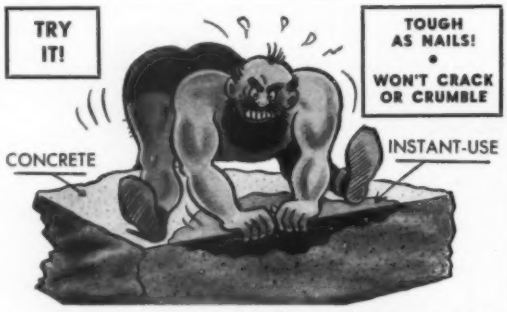
The partial basement areas, truck dock and boiler room are lighted by incandescent lamps and give an average illumination of 20 ft-c. The four 400-amp, 480/277-v, 3-phase, 4-wire, 60-cycle plug-in bus ducts running east and west over the manufacturing area are another indication of the flexibility of this building.

The heating system for the plant has been carefully planned to meet the requirements of each of the expansion stages. The initial building contains a boiler room that now houses a single 250 bhp fuel oil, natural gas or combination fired package steam generator that produces steam at 50 psig for all heating needs. Provision has been made for installation of a second boiler in this room to meet the first expansion stages.

Primary heating and ventilating of the building are accomplished by six air handling units mounted in groups of two on platforms in the truss space. These platforms hold steam coils, fans, filters, mixing chambers and duct outlets to clean and temper all the air drawn into the building. They include space for future cooling coils if they should be needed. The steam coils receive 50 psig steam for heating and temper-



Initial heating requirements are met by this single, 250 bhp packaged steam generator. The burning equipment will handle fuel oil, natural gas or a combination. Automatic air compressor and receiver, right, furnish shop air up to 100 psi



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- FOR GAUGING LIQUIDS OF ALL KINDS
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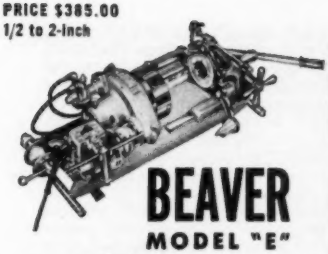

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GEARS RUN IN OIL

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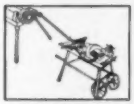
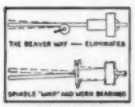
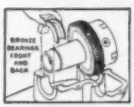


RUGGED STAND AVAILABLE



NO SPINDLE WHIP

SAFETY SWITCH LOCK



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Fewer Valves to Stock. Same valve operates either 2-way or 3-way, normally open or normally closed. 4-way valves also available. Pilot valves for remote control.

Fewer Parts to Stock. Every moving part of main or "master" valve fits in an easily removable cartridge. NO SPRINGS! Two sizes of cartridge fit all 5 valve sizes. Pilot heads (solenoid or pressure operated) fit any size valve.

Solenoids Easily Serviced. The specially designed solenoids can be disassembled to replace the coil, or to install a coil of another voltage.

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Pressures From 15 to 150 P.S.I.
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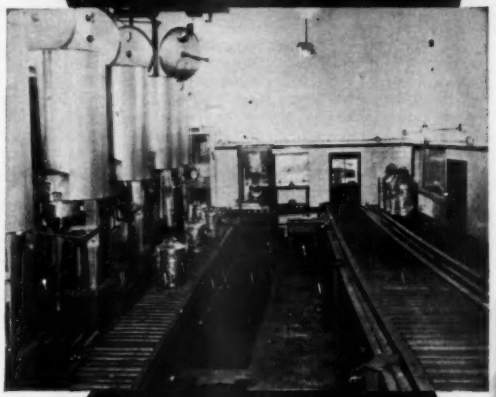

they're all ARGUTO

Spillage doesn't rust or stick the bearings in this conveyor at one of the world's largest coffee makers—no lubrication ever, and no oil drip. Arguto oilless bearings were specified, and every bearing rolls as free as the day installed, that's why breweries, bottlers, and other "wet packagers" insist on Arguto.

ARGUTO CONVEYOR ROLL BEARINGS
are EASY to INSTALL

Convert your conveyor to Arguto—simply remove present bearings from roller, and press in Arguto bearings. That's all there is to it. Your conveyor manufacturer will be glad to install Arguto on a new conveyor—just specify Arguto.

ARGUTO BEARINGS
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for immediate delivery

For any size roll. Also special designs to lick tough conveyor problems. Send sample, or drawings, or dimensions.

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20 years without a drink

ing fresh or recirculated air, depending on conditions.

The basement and lobby are heated by finned tube radiation with forced hot water circulation. Supplementary heat for the main floor is provided by propeller type unit heaters mounted around the perimeter of the building; 4 at each wall, 4 in the truck dock and 1 in the boiler room. Nine power roof ventilators over the manufacturing area provide normal winter and supplementary summer ventilation, and spot exhaust to meet process needs.

Control of the heating system is electro-pneumatic and can be varied to suit the season and the time of day. Maximum and minimum outside air, and return air dampers, and automatic steam control valves of ⅓ and ⅔ total coil capacity function together to give economical heating. Each set of two units has a summer-winter switch to cycle the heating and which can be used to purge the building in winter by admitting 100 per cent outdoor air.

One master day-night switch shuts down exhaust fans and positions dampers for 100 per cent recirculation at night. At night, the air handling units operate intermittently and then only if the unit heaters cannot maintain the 55 F temperature. The six supply fans operate continuously while the building is occupied.

The finned tube radiation is controlled automatically by varying the hot water convertor discharge temperature in accord with outside conditions. At night, or when the plant is idle, a thermostat set for 55 F operates the circulating pump intermittently. During winter days it pumps continuously.

Deep well water supplies all the needs of this plant. It is stored in a 125,000 gal, 30 ft dia gravity tank at a height of 125 ft, which supplies both industrial and wet-pipe sprinkler system water. The sprinkler system is automatic and the water tank is controlled so that at all times there will be at least 100,000 gal of water available for fire service.

To meet local fire regulations requiring that the quantity of water in the storage tank assigned for fire service be replaceable in 8 hours (when the well water flow was not equal to the required rate) it was necessary to construct a reservoir on the site. Capacity of the reservoir is 220,000 gal and it supplies water to the tank directly for process uses. It receives water from three wells, rainwater from the building roof and clear process water return.

A complete sewage disposal plant has been built out of the way of all future construction. This system plus the two drains at each column in the south half of the building, comprising an underflow piping grid, has introduced a new flexibility into the company's operations. One drain is for clear water that returns to the reservoir after such uses as cooling the presses, and the other carries fouled water to the treating plant. This prevents loss of time previously required to dump containers and wastes at a point remote from manufacturing areas.

The building has smooth red face brick up to sill height and corrugated asbestos siding backed with insulation. The flat roof is 20-year built up tar and gravel on 2⅝ in. precast insulating deck. The working areas of the building have a 15 ft clear height. Because of its long life and its comfort to employees, the plant consists of 2-in. southern yellow pine creosoted blocks on a 6-in. concrete slab.

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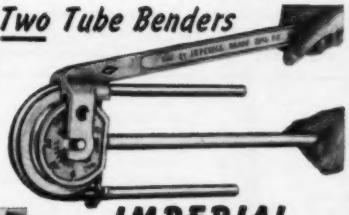

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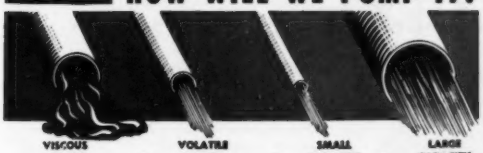

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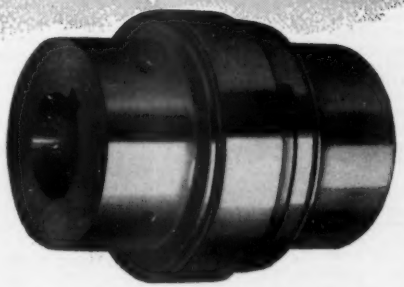

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For an Easier Way
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Ask your jobber—or write for DURA HOOK Bulletin No. PNDH covering sizes and prices.
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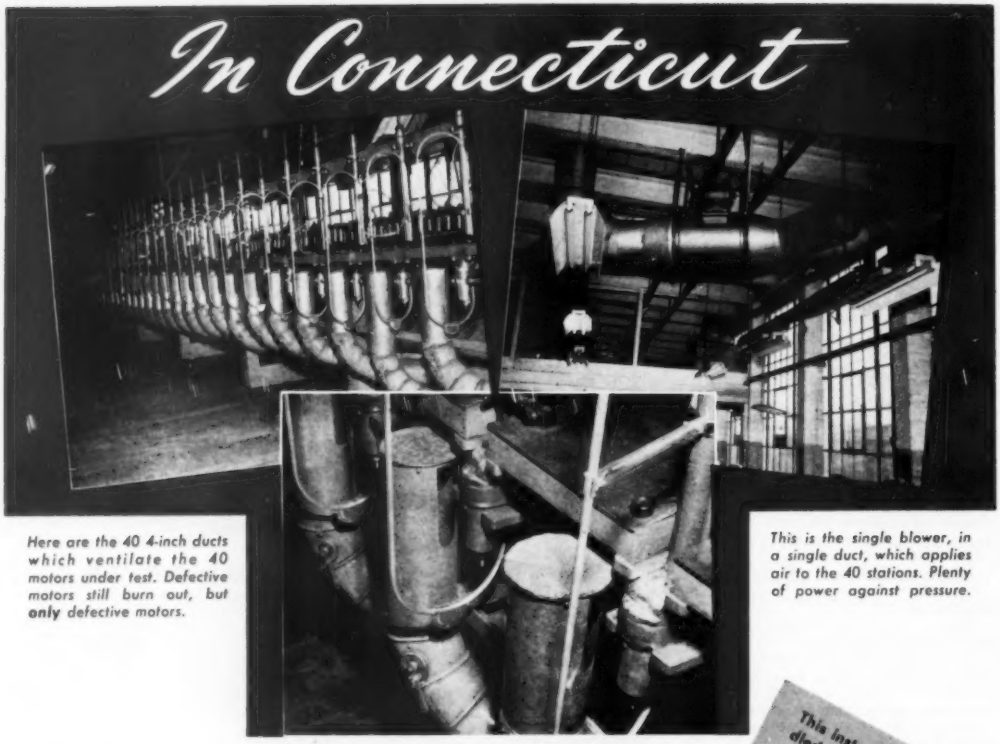

Here are the 40 4-inch ducts which ventilate the 40 motors under test. Defective motors still burn out, but **only** *defective motors.*

This is the single blower, in a single duct, which applies air to the 40 stations. Plenty of power against pressure.

Application of air to motor is mighty simple, as shown here. Yes, mighty simple . . . but mighty effective, too.

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Earns a Repeat Order

Lack of ventilation caused automobile antenna motors in the plant of a Connecticut manufacturer to burn out far too often on the test stand. A bank of 40 testing stations was involved.

The Hartzell field engineer installed a Hartzell VA21-BD vaneaxial blower in a 21-inch duct, bringing in air from the outside. From this, a 4-inch duct delivers air to each of the 40 motors under test.

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If something in the air is causing trouble, costing money, don't put up with it. Call your nearby Hartzell field office *now*, or mail the coupon below to us at the factory.

CLIP AND MAIL THIS COUPON NOW FOR INFORMATION

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You could know the plant... 20 years of steady growth ... 20 years of work, brains and money... then in 20 minutes a little fire got away and reduced it all to nothing.

But, your larger size fire hazards can be protected very efficiently at a reasonable cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area...to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

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WHEN BUSINESS STOPS . . . INCOME STOPS!
Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

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MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT
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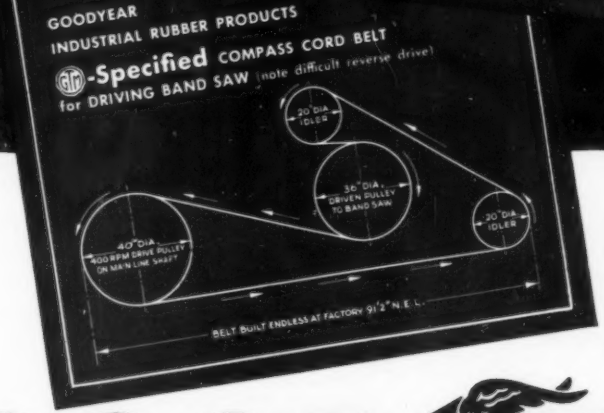
Service doubled

at ⅔ the belt cost

ORDINARY belts on band-saw drive stretched, caused shutdowns and lost production—failed completely after 6 years.

The G.T.M.—Goodyear Technical Man—specified COMPASS CORD belt built with single ply of load-carrying cords. COMPASS has served 13 years so far—still looks good for more service.

The COMPASS belt has never been touched since application—has saved at least $400 to $500 thus far.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